THE ENGINEERING INDEX

1920

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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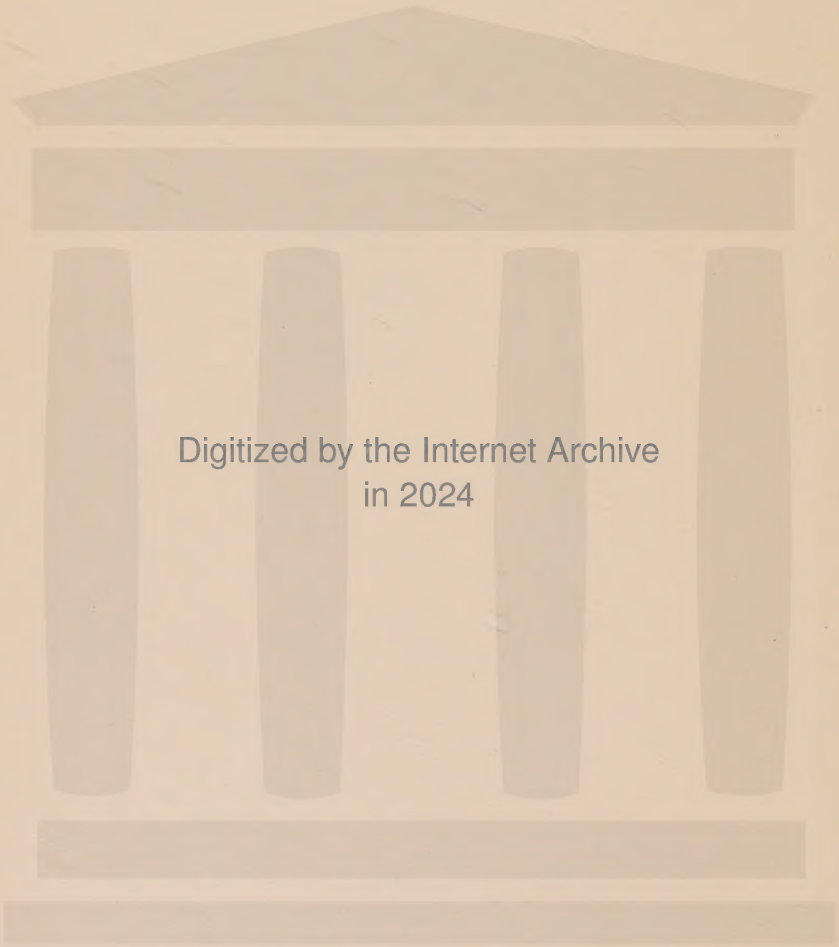
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THE ENGINEERING INDEX

1920

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PREFACE

IN this, the second volume of THE ENGINEERING INDEX to be issued by The American Society of Mechanical Engineers, the alphabetical or dictionary arrangement found so convenient and satisfactory in the 1919 volume has been retained. This method, substituted last year for the divisional arrangement previously employed, is exceedingly simple. Each item contains the exact title of the article indexed; the author's name, if given; the name of the periodical in which the article appeared; the volume, number, and date of publication; and the page numbers and number of figures in the article. It also includes a brief note summarizing the article indexed; and this feature, together with the numerous cross-references throughout the volume, makes it possible for one to confine his search to those particular articles which bear directly upon his problem.

The 1920 volume, containing 586 pages of the INDEX proper, is somewhat larger than that of last year. There are nearly 14,000 items referring to articles in some 700 engineering and allied technical publications, a list of which, giving the exact title of each publication, its place of publication and frequency of issue, will be found on pages vii-xv. In selecting these items the engineering staff of the Society has reviewed the 1200-odd periodicals, reports and publications regularly received during the year by the Engineering Societies Library (New York). These are printed in some ten different languages and comprise the most complete collection of scientific and engineering publications in the world.

THE ENGINEERING INDEX was acquired by the Society at the close of 1918, and was combined with the Selected Titles of Engineering Articles then appearing in the Society's monthly Journal, *Mechanical Engineering,* thus increasing the number of periodicals indexed threefold and bringing to the engineering world the facilities of the Library of the Engineering Societies. The book is a continuation of a work started in 1884, when Prof. J. B. Johnson, of Washington University, St. Louis, began to regularly index for the Journal of the Association of Engineering Societies the articles appearing in the leading current periodicals of that time. These comprised, as he said, *"The Engineering News, Van Nostrand's Engineering Magazine, The Journal of the Franklin Institute,* the *Transactions* of the American Engineering Societies of Civil, Mechanical, and Mining Engineers, the English journals *Engineering* and *The Engineer,* and the *Proceedings* of the Institution of Civil Engineers." The undertaking proved highly successful and at the end of five years Professor Johnson compiled and published the first volume of THE ENGINEERING INDEX.

As the work developed it seemed advisable to combine it with a somewhat similar service then being rendered by the Engineering Magazine Company (New York), and accordingly in 1895 the second volume, while edited under the direction of Professor Johnson, was published by that concern. From then on, until the close of 1918, THE ENGINEERING INDEX was regularly published by the Engineering Magazine Company; Volumes III and IV covered five years each, and succeeding issues appeared annually.

THE ENGINEERING INDEX is a regular feature of the Society's monthly publication *Mechanical Engineering,* to which the reader is directed for references to articles appearing since the close of 1920.

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THE ENGINEERING INDEX

Volume I, 1884 to 1891 inclusive, 475 pages . . . . . Out of Print
Edited and published by the Association of Engineering Societies under the direction of Prof. J. B. Johnson.

Volume II, 1892 to 1895 inclusive, 474 pages . . . . . Out of Print
Edited by the Association of Engineering Societies under the direction of Prof. J. B. Johnson.

Volume III, 1896 to 1900 inclusive, 1030 pages . . . . Out of Print

Volume IV, 1901 to 1905 inclusive, 1234 pages . . . . Out of Print

THE ENGINEERING INDEX ANNUAL FOR					1906, 412	pages	. . . .	$1.25
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"	"	"	"	"	1917, 363	"	. . Out of	Print
"	"	"	"	"	1918, 384	"	. . Out of	Print
THE ENGINEERING INDEX			. . .		1919, 528	"	. . . . .	$4.00
"	"	"	. . . .		1920, 586	"	. . . . .	$6.00

From 1892 to 1917 inclusive, THE ENGINEERING INDEX was published by The Engineering Magazine Co. In December 1918 it was acquired by The American Society of Mechanical Engineers.

The monthly continuation of THE ENGINEERING INDEX, from the close of 1920, will be found in *Mechanical Engineering*, The Journal of The American Society of Mechanical Engineers, 29 West 39th Street, New York.

LIST OF PERIODICALS INDEXED

Académie des Sciences, Comptes rendus des séances—Paris—Weekly

Acetylene and Welding Journal—London, England—Monthly

Acetylene Journal—Chicago—Monthly

Acetylen in Wissenschaft und Industrie—Halle a-S., Germany—Bi-monthly

Aera—See American Electric Railway Association. Aera

Aerial Age—New York—Weekly

Aeronautical Journal—London—Monthly

Aeronautics—London—Weekly

Aeronautique—Paris—Monthly

Aérophile—Paris—Semi-monthly

Affiliated Engineering Societies of Minnesota. Bulletin—St. Paul, Minn.—Monthly

Agricultural Engineering. Journal of the American Society of Agricultural Engineers—Ames, Iowa—Monthly

Agricultural and Mechanical College of Texas. Engineering Experiment Station Bulletin—College Station, Tex.—Irregular.

Allgemeine Automobil-Zeitung—Berlin—Weekly

American Academy of Arts and Sciences. Proceedings—Boston, Mass.—Irregular

American Architect—New York—Weekly

American Association for International Conciliation—New York—Monthly

American Association of Engineers. Monad.—Mount Morris, Ill.—Monthly

American Ceramic Society. Journal—Easton, Pa.—Monthly

American City. City Edition; Town and County Edition—New York—Monthly

American Chemical Society. Journal—Easton, Pa.—Monthly. **Journal of Industrial and Engineering Chemistry** — Easton, Pa.—Monthly

American Contractor—Chicago—Weekly

American Drop Forger—Pittsburgh, Pa.—Monthly

American Electric Railway Association. Aera—New York—Monthly

American Electric Railway Engineering Association. Preprints—New York—Irregular

American Electrochemical Society. Bulletin—Bethlehem, Pa.—Irregular

American Fertilizer—Philadelphia, Pa.—Bi-weekly

American Forestry Association. American Forestry—Baltimore, Md.—Monthly

American Gas Association Monthly—Easton, Pa.—Monthly

American Gas Engineering Journal—New York—Weekly

American Industries—New York—Monthly

American Institute of Architects. Journal—Washington, D. C.—Monthly

American Institute of Electrical Engineers. Proceedings; Journal—New York—Monthly

American Institute of Mining and Metallurgical Engineers. Journal—See Mining and Metallurgy

American Iron and Steel Institute. Special Statistical Bulletin—New York—Irregular

American Journal of Public Health—Chicago—Monthly

American Journal of Science—New Haven, Conn.—Monthly

American Machinist—New York—Weekly

American Marine Engineer—Norfolk, Va.—Monthly.

American Methematical Society. Bulletin (10 nos. yearly); **Transactions** (Quarterly)—Lancaster, Pa.

American Mineralogist—Lancaster, Pa.—Monthly

American Peat Society. Journal—Lancaster, Pa.—Quarterly

American Philosophical Society. Proceedings—Philadelphia, Pa.—7 nos. yearly

American Physical Society. Physical Review—Lancaster, Pa.—Monthly

American Railway Engineering Association. Bulletin—Chicago—10 nos. yearly

American Society for Steel Treating. Transactions—Chicago—Monthly

American Society for Testing Materials—Philadelphia, Pa.—**Proceedings**, yearly; **Book of Standards**, triennially

American Society of Agricultural Engineers. See Agricultural Engineering

American Society of Civil Engineers. Proceedings—New York—10 nos. yearly

American Society of Heating and Ventilating Engineers. Journal—New York—9 nos. yearly

American Society of Marine Draftsmen. Journal—Philadelphia, Pa.—Quarterly

American Society of Mechanical Engineers. Journal (Mechanical Engineering)—New York—Monthly

American Society of Mechanical Inspectors. Inspector—New York—Monthly

American Society of Naval Engineers. Journal—Washington, D. C.—Quarterly

American Society of Refrigerating Engineers. Journal—New York—Bi-monthly

American Steel Treaters' Society. Journal—Chicago—10 nos. yearly

American Water Works Association. Journal—Baltimore, Md.—Bi-monthly

Analyst—See Society of Public Analysts and Other Analytical Chemists. Analyst

Annalen der Chemie. See Liebig's Annalen

Annalen der Physik—Leipsic, Germany—Semi-monthly

Annalen für Gewerbe und Bauwesen—Berlin—Bi-weekly

Annales de Chimie—See Annales de Chimie et de Physique

Annales de Chimie et de Physique—Paris—Bi-monthly

Annales de Physique—See Annales de Chimie et de Physique

Annales des Mines—Paris—Quarterly

Annales des Mines de Belgique—Brussels, Belgium—Quarterly

Annales des Ponts et Chaussées—Paris—Bi-monthly

Annales des Postes, Télégraphes et Téléphones—Paris—Quarterly

Annales des Travaux Publics de Belgique—Brussels, Belgium—Bi-monthly

Annali d'Ingegneria e d'Architettura—See Societa degli Ingegneri e degli Architetti Italiani. Annali

Architectural Record—New York—Monthly

Architecture and Building—New York—Monthly

Archiv für Eisenbahnwesen—Berlin—Bi-monthly

Archiv für Elektrotechnik—Berlin—Monthly

Archiv für Post und Telegraphie—Berlin—Semi-monthly

Archives des Sciences Physiques et Naturelles—Geneva—Bi-monthly

Arizona Mining Journal—Phoenix, Ariz.—Monthly

Armierter Beton—Berlin—Monthly

Armour Engineer—Chicago—Semi-annually

Arms and Explosives—London—Monthly

Army Ordnance. Journal of the Army Ordnance Association—Washington, D. C.—Bi-monthly

Associated General Contractors of America. Bulletin—Chicago—Monthly

Association des Ingénieurs Electriciens—See Liége. Institut Electrotechnique Montefiore. Association des Ingénieurs Electriciens

Association des Ingenieurs Sortis de l'ecole Polytechnique de Bruxelles. Bulletin Technique—Brussels, Belgium—Irregular

Association of Civil Engineers. Cornell University—See Cornell University. Association of Civil Engineers

Association of Iron and Steel Electrical Engineers—Pittsburgh, Pa.—Monthly

Association Suisses des Electriciens. (Schweizerischer Elektrotechnischer Verein) Bulletin—Zurich, Switzerland—Monthly

Associazione Nazionale degli Ingegneri Italiane. Giornale Ufficiale—Milan, Italy—Tri-monthly

Australian Institute of Mining and Metallurgy. Proceedings—Melbourne, Australia—Quarterly

Autocar—London—Weekly

Autogene Metallbearbeitung—Halle a-S., Germany—Semi-monthly

Automobile Engineer—London—Monthly

Automobil-Rundschau—See Mitteleuropäischen Motorwagen Verein. Automobil-Rundschau

Automotive Industries—New York—Weekly

Automotive Manufacturer—New York—Monthly

Automotor Journal—London—Weekly

Aviation and Aeronautical Engineering—New York—Semi-monthly

Aviation and Aircraft Journal—Highland, N. Y.—Weekly

Bauingenieur—Berlin—Monthly

Belting and Transmission—Chicago—Semi-monthly

Berg- und Hüttenmännisches Jahrbuch—Vienna, Austria—Quarterly

Berichte der Deutschen Chemische Gesellschaft—Berlin—Irregular

Beton und Eisen—Berlin—20 nos. yearly

Der Betrieb—Berlin—Semi-monthly

Better Roads and Streets—Dayton, Ohio—Monthly

Black Diamond—Chicago—Weekly

Blast Furnace and Steel Plant—Pittsburgh, Pa.—Monthly

Boiler Maker—New York—Monthly

Boston Society of Civil Engineers. Journal—Boston, Mass.—10 nos. yearly

Brass World and Platers' Guide—New York—Monthly

Braunkohle—Halle a-S., Germany—Weekly

Brick and Clay Record—Chicago—Bi-weekly

British Engineering Standards Association Specifications—London—Irregular

Building Age—New York—Monthly

Building News and Engineering Journal—London—Weekly

Bulletin Technique de la Suisse Romande—Lausanne, Switzerland—Semi-monthly

Bulletin Technique du Bureau Veritas—Paris—Monthly

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Bureau of Mines, U. S. Dept. of the Interior—Washington, D. C.—Irregular

Bureau of Standards—See U. S. Dept. of Commerce

California State Mining Bureau—San Francisco—Irregular

Canada. Honorary Advisory Council for Scientific and Industrial Research—Ottawa, Canada—Irregular

Canadian Chemical Journal—Toronto—Monthly

Canadian Department of Mines. Mines Branch. Bulletin; Geological Survey—Ottawa, Canada—Irregular

Canadian Engineer—Toronto—Weekly

Canadian Foundryman and Metal Industry News—Toronto—Monthly

Canadian Institute of Mining and Metallurgy. Bulletin—Montreal, Canada—Monthly

Canadian Machinery and Manufacturing News—Toronto—Weekly

Canadian Manufacturer—Toronto—Monthly

Canadian Mining Institute. Bulletin—Montreal, Canada—Monthly

Canadian Mining Journal—Quebec, Canada—Weekly

Canadian Railway Club. Proceedings—Montreal—9 nos. yearly

Canadian Railway and Marine World—Toronto—Monthly

Car Foremen's Association of Chicago. Proceedings—Chicago—9 nos. yearly

Cement Mill and Quarry—Chicago—Semi-monthly

Cement and Engineering News—Chicago—Monthly

Central—London—Semi-yearly

Central Railway Club. Proceedings—New York—5 nos. yearly

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Chemical Age—London—Weekly

Chemical Age—New York—Monthly

Chemical Engineer—New York—Monthly

Chemical Engineering and Mining Review—Melbourne, Australia—Monthly

Chemical, Metallurgical and Mining Society of South Africa. Journal, Monthly—Johannesburg, South Africa

Chemical News and Journal of Physical Science—London—Weekly

Chemical Society of London. Journal—London—Monthly
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Chemical and Metallurgical Engineering—New York—Weekly
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Cleveland Engineering Society. Journal—Cleveland, Ohio—Bi-monthly
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Coal Trade Journal—New York—Weekly
Coast and Geodetic Survey, U. S. Dept. of Commerce—Washington, D. C.—Irregular
Cold Storage and Ice Association Proceedings—London—Irregular
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Dansk Ingeniörforening. Ingeniören—Copenhagen, Denmark—Semi-weekly
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Departments, United States Government. See United States Department of
Deutsche Optische Wochenschrift—Berlin—Bi-monthly
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Domestic Engineering—Chicago—Weekly
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Engineering and Contracting—Chicago—Weekly
Engineering and Industrial Management—London—Weekly
Engineering and Mining Journal—New York—Weekly
Engineers' Club of Philadelphia. Journal—Philadelphia, Pa.—Monthly
Engineers' Club of St. Louis. Journal—St. Louis, Mo.—Bi-monthly
Engineers' Society of Western Pennsylvania. Proceedings—Pittsburgh, Pa.—10 nos. yearly
English Electric Journal—London—Quarterly
English Mechanic and World of Science—London—Weekly
Excavating Engineer—Milwaukee—Monthly

Factory—Chicago—Semi-monthly
Faraday Society. Transactions—London—Irregular
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Fördertechnik und Frachtverkehr—Wittenburg, Germany—Bi-monthly
Forest Products Laboratory. Technical Notes—Madison, Wis.—Irregular
Forno Electtrico—Rome—Monthly
Forschungsarbeiten auf dem Gebiete des Ingenieurwesens—Berlin—Irregular
Fortschritte der Chemie Physik und physikalischen Chemie—Leipsic, Germany—Irregular
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Freight Handling and Terminal Engineering—New York—Monthly

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Government Printing Office. Annual Report—Washington, D. C.—Yearly
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Heating and Ventilating Magazine—New York—Monthly
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India Rubber Journal—London—Weekly
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Industrial Management—New York—Monthly
Industrie des Tramways et Chemins de Fer—Paris—Monthly
Industrie Electrique—Paris—Semi-monthly
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Institution of Mechanical Engineers. Journal—London—Monthly
Institution of Mining Engineers. Transactions—Westminster, England—Monthly
Institution of Mining and Metallurgy. Bulletin—London—Monthly
Institution of Petroleum Technologists. Journal—London—Irregular
Institution of Post Office Electrical Engineers. Post Office Electrical Engineers Journal—London—Quarterly
Institution of Surveyors, New South Wales. The Surveyor—Sydney, Australia—Monthly
Instituto de Engenharia. Boletin—S. Paulo, Brazil, S. A.—Irregular
International Marine Engineering—New York—Monthly
International Railway Association. Bulletin—Brussels—Monthly
International Sugar Journal—London—Monthly
Iowa State College of Agriculture and Mechanical Arts. Engineering Experiment Station. Bulletin—Ames, Ia.—Irregular
Iron Age—New York—Weekly
Iron Trade Review—Cleveland, Ohio—Weekly
Ironmonger—London—Weekly
Iron and Coal Trades Review—London—Weekly
Iron and Steel of Canada—Gardenvale, P. Q., Canada—Monthly
Iron and Steel Institute. Irregular Publications—London

Jahrbuch der drahtlosen Telegraphie und Telephonie—Berlin—Monthly
Jahrbuch der Radioactivität und Electronik—Leipsic, Germany—Quarterly
J. E. Aldred Lectures on Engineering Practice—Baltimore, Md.—Irregular
Journal de Chimie Physique—Geneva, Switzerland—Irregular
Journal de Physique et le Radium—Paris—Monthly
Journal de Physique Théorique et Appliquée—See Société Française de Physique
Journal de la Marine, le Yacht—Paris—Weekly
Journal des Usines à Gaz—Paris—Semi-monthly
Journal du Four Electrique—Paris—Semi-monthly
Journal für Gasbeleuchtung—Munich, Germany—Weekly
Journal of Accountancy—New York—Monthly

Journal of Agricultural Research—See U. S. Department of Agriculture

Journal of Electricity—San Francisco, Cal.—Semi-monthly

Journal of Forestry—See Society of American Foresters. Journal of Forestry

Journal of Geology—Chicago—Semi-quarterly

Journal of Industrial and Engineering Chemistry. See American Chemical Society

Journal of Physical Chemistry—Ithaca, N. Y.—Monthly

Journal of the United States Artillery—Ft. Monroe, Va.—Monthly

Journal—See also names of Institutes, Institutions, Societies, etc.

Kali—Halle a-S., Germany—Semi-monthly

Kolloid-Zeitschrift—Dresden, Germany—Monthly

Koninklijk Institut van Ingenieurs. Ingenieur—The Hague, Netherlands—Weekly

Kraft und Betrieb—Hamburg, Germany—Semi-monthly

Kunststoffe—Munich, Germany—Semi-monthly

Kyoto Imperial University, College of Science. Memoirs—Kyoto, Japan—Irregular

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Lancaster and Cheshire Coal Research Association. Bulletin—Manchester, England—Irregular

Liebig's Annalen der Chemie—Leipsic, Germany—Monthly

Liége. Institut Electrotechnique Montefiore. Association des Ingenieurs Electriciens. Bulletin—Liége, Belgium—Monthly

Locomotive of the Hartford Steam Boiler Inspection and Insurance Co.—Hartford, Conn.—Quarterly

London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science—London—Monthly

Louisiana Engineering Society. Proceedings—New Orleans, La.—Bi-monthly

Louisiana Planter and Sugar Manufacturer—New Orleans, La.—Weekly

Luftfahrt—Berlin—Monthly

Machinery—London—Weekly

Machinery—New York—Monthly

Machinery Market—London—Weekly

Managing Engineer—London—Monthly

Manufacturers' Record—Baltimore, Md.—Weekly

Marine Engineer and Naval Architect—London—Monthly

Marine Engineering—New York—Monthly

Marine Engineering and Canadian Merchant Service Guild Review—Toronto—Monthly

Marine Engineering of Canada—Toronto—Monthly

Marine News—New York—Monthly

Marine Review—Cleveland, Ohio—Monthly

Massachusetts Institute of Technology. Bulletin—Boston, Mass.—Irregular

Mechanical Engineering. Journal of the American Society of Mechanical Engineers—New York—Monthly

Mechanical World—Manchester—Weekly

Metal Industry—London—Weekly

Metal Industry—New York—Monthly

Metal Trades—San Francisco, Cal.—Monthly

Metal Worker, Plumber and Steam Fitter—New York—Weekly

Metall—Berlin—Semi-monthly

Metall-Technik—Berlin—Weekly

Metall und Erz—Halle a-S., Germany—Semi-monthly

Métallurgie—Paris—Weekly

Métaux, Alliages et Machines—Paris—Monthly

Michigan Technic—See University of Michigan

Military Engineer. See U. S. War Department

Mineralogical Society. Mineralogical Magazine—London—Irregular

Mining Congress Journal—Washington, D. C.—Monthly

Mining Institute of Scotland. Transactions—Westminster, England—5 nos. yearly

Mining Journal—London—Weekly

Mining Magazine—London—Monthly

Mining and Engineering Record—Vancouver, B. C.—Monthly

Mining and Metallurgy, Journal of the American Institute of Mining and Metallurgical Engineers—New York—Monthly

Mining and Oil Bulletin—Los Angeles, Cal.—Monthly

Mining and Scientific Press—San Francisco, Cal.—Weekly

Mitteleuropäischer Motorwagen-Verein. Automobil Rundschau—Berlin—Semi-monthly

Model Engineer and Electrician—London—Weekly

Montanistische Rundschau—Berlin—Semi-monthly

Motor Age—Chicago—Weekly

Motor Boat—New York—Semi-monthly

Motor Boating—New York—Monthly

Motorship—New York—Monthly

Motor Traction—London—Weekly

Motorwagen Automobil- und Flugtechnische Zeitschrift—Berlin—Tri-monthly

Municipal Engineers' Journal—New York—Quarterly

Municipal Journal and Public Works—New York—Weekly

Municipal and County Engineering—Indianapolis, Ind.—Monthly

Mysore Engineers Association. Bulletin—Bangalore, India—Quarterly

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National Academy of Sciences. Proceedings—Washington, D. C.—Monthly

National Advisory Committee for Aeronautics. Bulletins—Washington, D. C.—Irregular

National Board of Fire Underwriters. Underwriters Laboratories—Chicago—Irregular

National Electric Light Association. Bulletin—New York—Monthly

National Engineer—Chicago—Monthly

National Fire Protection Association. Quarterly—Boston, Mass.—Quarterly

National Gas Engine Association. Bulletin—Chicago—Monthly

National Industrial Conference Board—Boston, Mass.—Irregular

National Lime Association. Bulletin—Washington, D. C.—Irregular

National Service with the International Military Digest—New York—Monthly

Natural Gas and Gasoline Journal—Buffalo, N. Y.—Monthly

Nature—London—Weekly

La Nature—Paris—Weekly

Nautical Gazette—New York—Weekly

New England Railroad Club. Proceedings of Meetings—Boston, Mass.—8 nos. yearly

New England Street Railway Club. Street Railway Bulletin—Boston, Mass.—Monthly

New England Water Works Association. Journal —Boston, Mass.—Quarterly

New York Department of Labor. State Industrial Commission. Industrial Code. Bulletin—Albany, N. Y.—Irregular

New York Railroad Club. Official Proceedings—New York—9 nos. yearly

New Zealand Journal of Science and Technology —Wellington, N. Z.—Bi-monthly

North-East Coast Institution of Engineers and Shipbuilders. Transactions—Newcastle-upon-Tyne, England—Yearly

Nuovo Cimento—Pisa, Italy—Monthly

Oel- und Gasmaschine—Berlin—Monthly

Oildom—New York—Monthly

Oil News—Chicago—Semi-monthly

Oil and Gas Journal—Tulsa, Okla.—Weekly

One Thousand and One Uses for Gas—London—Monthly

Organ für die fortschritte des Eisenbahnwesens —Berlin—Semi-monthly

L'Outillage—Paris—Weekly

L'Ouvrier Moderne—Paris—Monthly

Pacific Builder and Engineer—Seattle, Wash.—Weekly

Pacific Marine Review—San Francisco, Cal.—Monthly

Pacific Railway Club. Proceedings—San Francisco, Cal.—Monthly

Pacific Service Magazine—San Francisco, Cal.—Monthly

Pahasapa Quarterly—See South Dakota School of Mines

Paint Manufacturers' Association of the U. S. Circulars—Philadelphia, Pa.—Irregular

Paper—New York—Weekly

Paper Mill and Wood Pulp News—New York—Weekly

Pennsylvania Department of Labor and Industry. Bulletin—Harrisburg, Pa.—Irregular

Petroleum—Berlin—Tri-monthly

Petroleum Times—London—Weekly

Petroleum World—London—Monthly

Philippine Journal of Science—Manila—Bi-monthly

Physical Review—See American Physical Society

Physical Society of London. Proceedings—London—5 nos. yearly

Physikalische Zeitschrift—Leipsic, Germany—Semi-monthly

Popular Engineer—Philadelphia, Pa.—Monthly

Post Office Electrical Engineers Journal—See Institution of Post Office Electrical Engineers

Power—New York—Weekly

Power House—Toronto—Semi-monthly

Power Plant Engineering—Chicago—Semi-monthly

Power Wagon—Chicago—Monthly

Practical Engineer—London—Weekly

Der praktische Maschinen-Konstrukteur—Leipsic, Germany—Weekly

Proceedings—See names of Institutes, Institutions, Societies, etc.

Professional Engineer—Mount Morris, Ill.—Monthly

Prometheus—Berlin—Weekly

Public Works—New York—Weekly

Purdue University. Publications of the Engineering Departments—Lafayette, Ind.—Irregular

Quarry—London—Monthly

Queen's University. Queen's Quarterly—Kingston, Canada—Quarterly

Radio Review—London—Monthly

Radioélectricité—Paris—Monthly

Radium—Paris—Monthly

Radium—Pittsburgh, Pa.—Monthly

Railroad Herald—Atlanta, Ga.—Monthly

Railway Age—New York—Daily Edition

Railway Age—New York—Weekly

Railway Club of Pittsburgh, Official Proceedings —Pittsburgh, Pa.—9 nos. yearly

Railway Electrical Engineer—New York—Monthly

Railway Engineer—London—Monthly

Railway Gazette and Railway News—London—Weekly

Railway Journal—Chicago—Monthly

Railway Maintenance Engineer—Chicago—Monthly

Railway Mechanical Engineer—New York—Monthly

Railway Review—Chicago—Weekly

Railway Signal Engineer—Chicago—Monthly

Railway and Locomotive Engineering—New York —Monthly

Rauch und Staub—Düsseldorf, Germany—Monthly

Raw Material—New York—Monthly

Refrigerating World—New York—Monthly

Refrigeration—Atlanta, Ga.—Monthly

Revista Minera, Metalurgica y de Ingenieria—Madrid, Spain—Weekly

Revista de Estudios de Ingenieria—Caracas, Venezuela—Monthly

Revista de Obras Publicas—Madrid, Spain—Bi-weekly

Revue de l'ingenieur et index technique—Brusselles, Belgium—Monthly

Revue de Métallurgie—Paris—Monthly

Revue Générale de l'Electricité—Paris—Weekly

Revue générale des Chemins de Fer et des Tramways—Paris—Monthly

Revue Générale des Sciences pures et appliquées —Paris—Semi-monthly

Revue Trimestrielle Canadienne—Montréal, Canada—Irregular

Revue Universelle des Mines, de la Métallurgie, des Travaux Publics, des Sciences et des Arts Appliquées a l'Industrie—Liége—Semi-monthly

Rivista Marittima—Rome, Italy—Monthly

Rivista d'Ottica e Meccanica di Precisione—Firenze, Italy—Bi-monthly

Rivista Tecnica delle Ferrovie Italiane—Rome, Italy—Monthly

Rock Products—Chicago—Bi-weekly

Rohölindustrie—Vienna, Austria—Monthly

Royal Dublin Society. Scientific Proceedings—Dublin, Ireland—Monthly

Royal Institute of British Architects. Journal —London—Monthly

Royal Society. Proceedings—London—Irregular

Royal Society of Arts. Journal—London—Weekly

Royal Society of London. Philosophical Transactions—London—Irregular

Royal Society of Victoria. Proceedings—Melbourne, Australia—Irregular
Royal United Service Institution. Journal—London—Quarterly
Rubber Age—London—Monthly
Rudder—New York—Monthly

Safety Engineering—New York—Monthly
St. Louis Railway Club. Official Proceedings—St. Louis, Mo.—Monthly
Salt Lake Mining Review—Salt Lake City, Utah—Semi-monthly
Scale Journal—Chicago—Monthly
Schiffbau—Berlin—Weekly
Schweizerische Bauzeitung—Zurich, Switzerland—Weekly
Schweizerischer Elektrotechnischer Verein—See Association Suisse des Electriciens. Bulletin
Science—Lancaster—Weekly
Science and Art of Mining—Wigan, England—Bi-weekly
Scientific American—New York—Weekly
Scientific American Monthly—New York—Monthly
Scientific American Supplement—New York—Weekly
Scientific Monthly—Garrison, N. Y.—Monthly
Sheet Metal Worker—Cooperstown, N. Y.—Bi-weekly
Shipbuilder — Newcastle-on-Tyne, England — Monthly
Shipbuilding and Shipping Record—London—Weekly
Shipping—New York—Weekly
Smithsonian Institution—See U. S. National Museum
Sprechsaal—See Zeitschrift für keramischen Glass und verwander Industrie
Sociedad Cientifica "Antonio Alzate." Memorias y revista—Mexico, Mex.—Irregular
Sociedad Cientifica Argentina. Anales—Buenos Aires, Argentine, S. A.—Irregular
Sociedad de Ingenieros del Peru. Informaciones y memorias—Lima, Peru, S. A.—Monthly
Societa degli Ingegneri e degli Architetti Italiani. Annali d'ingegneria e d'architetturia—Rome, Italy—Monthly
Société Belge des Electriciens. Bulletin—Brussels, Belgium—Monthly
Société Chimique de France. Bulletin—Paris—Semi-monthly
Société Française de Physique. Journal de Physique Théorique et Appliquée—Paris—Monthly
Société Française des Electriciens. Bulletin—Paris—Monthly
Société industrielle de l'Est. Bulletin—Nancy, France—Monthly
Société industrielle de Mulhouse. Bulletin—Mulhouse, France—Monthly
Société d'Encouragement pour l'Industrie Nationale. Bulletin—Paris—Bi-monthly
Société de l'Industrie Minérale. Bulletin et comptes rendus mensuels—Paris—Monthly
Société des Ingénieurs Civils de France. Memoires et Travaux—Paris—Bi-monthly
Society for the Promotion of Engineering Education. Bulletin—See Engineering Education
Society of American Foresters. Journal of Forestry—Washington, D. C.—8 times yearly
Society of Automotive Engineers. Journal—New York—Monthly
Society of Chemical Industry. Journal—London—Weekly
Society of Engineers. Journal and Transactions—Westminster, England—Irregular
Society of Glass Technology. Journal—Sheffield, England—Quarterly
Society of Industrial Engineers—Chicago—Monthly
Society of Naval Architects and Marine Engineers. Advance Papers, 28th General Meeting—New York—Irregular
Society of Public Analysts and Other Analytical Chemists. Analyst—London—Monthly
South African Association for the Advancement of Science. South African Journal of Science—Johannesburg, Africa—Irregular
South African Engineering—London—Monthly
South African Institute of Electrical Engineers. Transactions—Johannesburg, South Africa—Monthly
South African Institution of Engineers. Journal—Johannesburg, South Africa—Monthly
South African Journal of Industries—Pretoria, South Africa—Monthly
South African Mining and Engineering Journal—Johannesburg, South Africa—Weekly
South Dakota School of Mines. Pahasapa Quarterly—Rapid City, S. D.—Quarterly
Southern Engineer—Atlanta, Ga.—Monthly
Southern and Southwestern Railway Club. Official Proceedings—Atlanta, Ga.—Bi-monthly
South Wales. Institute of Engineers. Proceedings—Cardiff, Wales—Irregular
Southwestern Electrician—Houston, Tex.—Monthly
Sperryscope—Brooklyn—Monthly
Stahl und Eisen—Düsseldorf, Germany—Weekly
Steam—New York—Monthly
Steamship—Leith, Scotland—Monthly
Steel Testing Research Society. Proceedings—Detroit, Mich.—Irregular
Stevens Indicator—Hoboken, N. J.—Quarterly
Stone—New York—Monthly
Stone and Webster Journal—Boston—Monthly
Street Railway Bulletin—See New England Street Railway Club
Sugar—New York—Monthly
Surveyor—See Institution of Surveyors, New South Wales. The Surveyor
Surveyor and Municipal and County Engineer—London—Weekly

Taylor Society. Bulletin—New York—Bi-monthly
Tech Engineering News—Cambridge, Mass.—9 nos. yearly
Technique automobile et aerienne—Paris—Monthly
Technique Moderne—Paris—Monthly
Teknisk Tidsskrift—Copenhagen, Denmark—Semi-monthly
Teknisk Ukeblad—Christiania, Norway—Weekly
Telegraph and Telephone Age—New York—Semi-monthly
Telegraph and Telephone Journal—London—Bi-monthly
Telegraphen- und Fernsprech-Technik—Berlin—Monthly
Telephone Engineer—Chicago—Monthly
Telephone—Chicago—Weekly
Terrestrial Magnetism and Atmospheric Electricity—Cincinnati, Ohio—Quarterly

Texas Agricultural and Mechanical College, Dept. of Forestry and Engineering Experiment Station. Bulletin—College Station, Tex.—Irregular

Textile World Journal—New York—Weekly

Times Engineering Supplement—London—Monthly

Tôhohu Imperial University. Science Reports and Technical Reports—Sendai, Japan—Irregular

Tokyo Imperial University, College of Engineering. Journal—Tokyo, Japan—Irregular

Tonindustrie-Zeitung—Berlin—Tri-weekly

Tramway and Railway World—London—Monthly

Transactions—See also names of Institutes, Institutions, Societies, etc.

Transportation World—New York—Monthly

Underwriters' Laboratories—See National Board of Fire Underwriters

United States Department of Agriculture—Irregular Publications—Washington, D. C.
- Bulletins and Circulars
- Journal of Agricultural Research
- Public Roads
- Monthly Weather Review

United States Department of Commerce—Irregular Publications—Washington, D. C.
- Bureau of Census
- Bureau of Foreign and Domestic Commerce —Consular and Trade Reports
- Bureau of Standards
  - Bulletins and Circulars
  - Scientific Papers
  - Technical Papers
  - Technologic Papers
- Coast and Geodetic Survey
- Radio Service Bulletin

United States Department of the Interior—Irregular Publications—Washington, D. C.
- Bureau of Education
- Bureau of Mines
- General Land Office
- Geological Survey
- Reclamation Service

United States Department of Labor. Labor Statistics Bureau, Monthly Labor Review—Washington, D. C.—Monthly

United States Geological Survey—Washington, D. C.—Irregular

United States National Museum. Smithsonian Institution—Washington, D. C.—Irregular

United States Naval Institute. Proceedings—Annapolis, Md.—Monthly

United States Tariff Commission—Washington, D. C.—Irregular

United States Treasury Department. Public Health Service Reports—Washington, D. C. —Weekly

United States War Department
- Air Service, Eng. Div.—Dayton, Ohio—Irregular
- Army and Engineering Dept. Corps Engrs. Military Engineer—Washington, D. C. —Bi-monthly
- Engineer School, Washington Barracks. Occasional Papers—Washington, D. C.

Universal Engineer—Cooperstown, N. Y.—Monthly

University of California. Publications in Engineering—Berkeley, Cal.—Irregular

University of Idaho School of Mines. Bulletin —Moscow, Idaho—Monthly

University of Illinois. Bulletin—Urbana, Ill.—Weekly

University of Michigan. Engineering College. Michigan Technic—Ann Arbor, Mich.—Quarterly

University of Minnesota. Bulletin—Minneapolis —Irregular

University of Missouri. Bulletin—Columbia, Mo. —Irregular

University of Montana. Bulletin—Butte, Mont. —Irregular

University of Utah. State School of Mines. Bulletin—Salt Lake City, Utah—Irregular

Utah Society of Engineers. Journal—Salt Lake City, Utah—Monthly

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Verhandlungen des Vereins zur Förderung des Gewerbefleisses—Berlin—10 nos. yearly

Verkerstechnik—Berlin—Weekly

La Vie Automobile—Paris—Bi-monthly

La Vie Technique & Industrielle—Paris—Monthly

Washington Academy of Sciences. Journal—Baltimore, Md.—Semi-monthly

Washington, University of. Engineering Experiment Station. Bulletin—St. Louis, Mo.— Irregular

Water Power League of America. Bulletin—New York—Monthly

Welding Engineer—Chicago—Monthly

Werkstattstechnik—Berlin—Semi-monthly

West of Scotland Iron and Steel Institute. Journal—Glasgow, Scotland—Monthly

Western Society of Engineers. Journal—Chicago —Semi-monthly

Wireless Age—New York—Monthly

Wireless World—London—Semi-monthly

Wirtschafts-Motor. Nutz-Motor—Berlin—Monthly

Wisconsin Engineer—Madison, Wis.—Monthly

Wood-Worker—Indianapolis, Ind.—Monthly

Worcester Polytechnic Institute. Journal—Worcester, Mass.—Quarterly

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Zeitschrift der deutschen Gesellschaft für Mechanik und Optik—Berlin—Semi-monthly

Zeitschrift des Bayerischen Revisions-Vereins— Munich, Germany—Semi-monthly

Zeitschrift des Osterreichische Ingenieur- und Architekten-Vereins—Vienna, Austria—Weekly

Zeitschrift des Vereins deutscher Ingenieure— Berlin—Weekly

Zeitschrift des Vereins der deutschen Zucker-Industrie—Berlin—Monthly

Zeitschrift für angewandte Chemie—Leipsic, Germany—Semi-weekly

Zeitschrift für Anorganische und Allgemeine Chemie—Leipsic, Germany—Irregular

Zeitschrift für Bauwesen—Berlin—Quarterly

Zeitschrift für Beleuchtungswesen—Berlin—Semimonthly

Zeitschrift für Dampfkessel und Machinenbetrieb —Berlin—Weekly

Zeitschrift für Eis- und Kälte-industrie—Vienna —Monthly

Zeitschrift für Flugtechnik und Motorluftschiffahrt —Munich, Germany—Semi-monthly

Zeitschrift für Instrumentenkunde—Berlin — Monthly

Zeitschrift für keramischen Glass und Verwandten Industrien. Sprechsaal—Coburg, Germany—Weekly

Zeitschrift für Kleinbahnen—Berlin—Monthly

Zeitschrift für komprimierte und flüssige Gase sowie für die Pressluft-industrie—Weimar, Germany—Monthly

Zeitschrift für Physik—Braunschweig, Germany—Monthly

Zeitschrift für physikalische Chemie—Leipsic, Germany—Irregular

Zeitschrift für praktische Geologie—Berlin—Monthly

Zeitschrift für Sauerstoff- und Stickstoff-industrie—Leipsic, Germany—Semi-monthly

Zeitschrift für das Berg-, Hütten- und Salinenwesen—Berlin—Irregular

Zeitschrift für das gesamte Schiess und Sprengstoffwesen—Munich—Semi-monthly

Zeitschrift für das gesamte Turbinenwesen—Munich, Germany—Tri-monthly

Zeitschrift für die gesamte Giessereipraxis Eisenzeitung—See Eisen Zeitung

Zeitschrift für die gesamte Kälte-industrie—Munich, Germany—Monthly

Zeitung des Vereins deutscher Eisenbahnverwaltungen—Berlin—Semi-weekly

Zentralblatt der Bauverwaltung—Berlin—Semi-weekly

Ziegelwelt. See Deutsche Töpfer-und Ziegler-Zeitung Ziegelwelt.

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CONVENTIONS USED IN INDEXING

Abbreviations

In addition to the commonly accepted abbreviations, the following have also been employed in this volume of The Engineering Index:

Academy (Acad.)
American (Am.)
Associated (Assoc.)
Association (Assn.)
Bulletin (Bul.)
Bureau (Bur.)
Canadian (Can.)
Chemical, Chemistry (Chem.)
Electrical, Electric (Elec.)
Electrician (Elecn.)
Engineer [s] (Engr. [s])
Engineering (Eng.)
Gazette (Gaz.)
General (Gen.)
Geological (Geol.)
Heating (Heat.)
Industrial (Indus.)
Institute (Inst.)
Institution (Instn.)
International (Int.)
Journal (Jl.)
London (Lond.)
Machinery (Machy.)
Machinist (Mach.)
Magazine (Mag.)
Marine (Mar.)
Materials (Matls.)
Mechanical (Mech.)
Metallurgical (Met.)
Mining (Min.)
Municipal (Mun.)
National (Nat.)
New England (N. E.)
Proceedings (Proc.)
Record (Rec.)
Refrigerating (Refrig.)
Review (Rev.)
Railway (Ry.)
Scientific or Science (Sci.)
Society (Soc.)
State Names (Ill., Pa., etc.)
Supplement (Supp.)
Transactions (Trans.)
Ventilating (Vent.)
Western (West.)

Cross-References

Main headings of the Index are printed in bold-face capital letters; sub-headings in bold-face small letters. Cross-references printed in capital letters indicate main headings; those in small letters indicate sub-headings. Whenever a cross-reference is given in small letters only, it refers to a sub-heading under the same main heading as the cross-reference itself.

Cross-references enclosed in brackets apply to the main heading under which they appear, not to the item or group of items immediately preceding.

THE ENGINEERING INDEX

1920

A

ABRASIVE WHEELS

Breakage of. Various Causes of Grinding Wheel Breakage, Harold E. Jenks. Can. Machy., vol. 23, no. 5, Jan. 29, 1920, pp. 137-139. Following underlying causes are mentioned: Centrifugal force, direct pressure exerted by work on wheel, heating of wheel or spindle, grinding on side of wheel, improper mounting, impact on side of face of wheel, cracks or flaws in structure, lack of balance and initial stresses.

Manufacture and Uses. Grinding Wheels; Their Manufacture, Uses in Industry, and Factors Affecting Their Selection. Wallace T. Montague. Proc. Engrs. Soc. Western Pa., vol. 36, no. 3, April 1920, pp. 205-216 and (discussion) pp. 217-220. Includes table giving recommended speeds for different classes of grinding.

Mounting. Reducing Grinding Wheel Failure, Harold E. Jenks. Iron Trade Rev., vol. 65, no. 26, Dec. 25, 1919, pp. 1712-1714. Classification of causes of failure. Importance of proper mounting on wheels.

Performance of. Performance of Disk Grinders (Schleifleistungen von Schleifbelägen und Flächenschliff), Emil Zopf. Werkstattstechnik, vol. 14, no. 4, Feb. 15, 1920, pp. 102-105, 15 figs. Describes various machines and gives examples of their working efficiency.

Selection and Mounting. The Use of Abrasive Wheels for Metal Cutting, Edwin L. Monk. Can. Machy., vol. 22, no. 24, Dec. 11, 1919, pp. 576-578, 2 figs. Directions in regard to selection and mounting of wheels.

Testing. Testing Abrasive Wheels for Efficiency, Raymond Francis Yates. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 139-141, 6 figs. Machine developed by writer for conducting efficiency tests on abrasive wheels.

ABRASIVES

Aloxite AA. A New Abrasive of Aluminous Material, Otis Hutchins. Iron Age, vol. 105, no. 13, Mar. 25, 1920, pp. 873-874, 3 figs. Also in Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 113-114, 3 figs., and Chem. & Met. Eng., vol. 22, no. 12, Mar. 24, 1920, p. 565, 3 figs. Photomicroscopic comparison of Aloxite AA with aluminous abrasives of ordinary type. Cutting power of Aloxite AA is increased, it is said, due to greater amount of crystallized alumina present.

Artificial. The Manufacture of Artificial Abrasives in the Electric Furnace, C. J. Brockbank. Jl. Soc. Chem. Industry, vol. 39, no. 4, Feb. 28, 1920, pp. 41T-44T, 4 figs. Special reference is made to carborundum, of which photomicrographs are shown illustrating various stages in process of crystalline formation.

Heat Treatment by Electricity in Modern Chemical and Metallurgical Industries (L'electrothermie à haute température dans les industries chimiques et métallurgiques modernes), Jean Escard. Industrie Electrique, vol. 28, no. 657, Nov. 10, 1919, pp. 403-411. Manufacture of carborundum, crystolon, silundum, corundum, alundun and artificial emeries.

ABSORPTION TOWERS

See TOWERS, Absorption.

ACCELEROMETERS

See AERONAUTICAL INSTRUMENTS, Accelerometer.

ACCIDENT PREVENTION

Blast Furnaces. Is Industrial Death Necessary? Lucian W. Chaney. Safety Eng., vol. 38, no. 4, Oct. 1919, pp. 196-198. Analysis of cases leads writer to conclude that accidents decrease with improved construction, especially in blast furnaces. Paper read at Eighth Annual Safety Congress.

Canada. Organized Accident Prevention, Thomas Findley. Can. Manufacturer, vol. 40, no. 1, Jan. 1920, pp. 85-86. Experience of Toronto factory.

Clay Plants. Accident Prevention on the Clay Plant. Brick & Clay Rec., vol. 57, no. 6, Sept. 21, 1920, pp. 485-487, 4 figs. Shows how dangers around brick machines can be reduced.

Coöperation of Employees. Accident Prevention Akin to Good Sportsmanship, J. F. Belford. Eng. & Min. Jl., vol. 108, no. 22, Dec. 13 and 20, 1919, pp. 900-902. Experience of American Smelting and Refining Co. is said to have proven that coöperation of employees may be secured in spirit of fair play and good fellowship.

Elevators. See ELEVATORS, Accident Prevention.

Foremen's Instructions. Instructions to Construction Foremen for Prevention of Accidents. Eng. & Contracting, vol. 52, no. 25, Dec. 17, 1919, pp. 692-694. Prepared by Erection Department of McClintic-Marshall Construction Co.

Forge Shops. Accident Prevention in Forge Shops, by G. A. Kuechenmeister. Amer. Drop Forger, vol. 6, no. 6, June 1920, pp. 282-286, 4 figs. Suggests that safety departments may be or-

ganized in exactly the same manner and will be as efficient and helpful as in steel and other industries. Paper read before Am. Drop Forge Assn.

Lighting, Value in. The Value of Proper Illumination, F. D. Fagan, R. E. Fisher and Hugh W. Kimball. Jl. Electricity, vol. 44, no. 4, Feb. 15, 1920, pp. 152-156. Value of proper illumination is pointed out in prevention of accidents, conservation of health and in promoting sales in store and show windows.

Machine-Building Industry. Accidents and Accident Prevention in Machine Building. U. S. Dept. Labor, Bur. Labor Statistics, no. 256, 1920, 123 pp., 25 figs. Based on accident records of 194 plants in 1912. Accident hazards in particular departments and occupations as well as reason and causes for occurrence of accidents are pointed out and methods of prevention which have been found to operate successfully are indicated.

Mines. See MINING, Accident Prevention in.

Oxy-Acetylene Welding. See OXY-ACETYLENE WELDING, Accident Prevention.

Railway Work. Safety in Railway Working, J. Tréviéres. Bul. Int. Ry. Assn., vol. 2, no. 4, April 1920, pp. 204-212. French Ministerial Circular of Nov., 1919, orders that all absolute stop signals, danger semaphores, as well as distant-signal disks and signals at junctions and other dangerous places, be supplemented by detonators, unless such signals are fitted with electrical or mechanical repeating appliances; also that on lines fitted with block system, trains stopped within 1,100 yd. of their protecting semaphore, be protected by hand-placed detonators laid 1,100 yd. in rear of such trains. Translated from Genie Civil.

Safety Committees. Ford Collieries Co. Reduced Its Accident Insurance Cost, Donald J. Baker. Coal Age, vol. 17, no. 16, Apr. 15, 1920, pp. 743-748, 16 figs. Record of one fatal accident for output of 3,000,000 tons is attributed to activities of Safety Committee composed of all officials supervising work.

Supervision in. Supervision as a Factor in Accident Prevention, L. A. De Blois. Safety Eng., vol. 38, no. 4, Oct., 1919, pp. 199-202. Discusses engineering revision, safety education, question of responsibility, results obtained in one plant built during war, and frequency and severity rates. Paper read before Eighth Annual Safety Congress.

Work in Various States. Accident Prevention. Bur. Labor Statistics, no. 264, Oct. 1919, pp. 14-47. Survey of accident-prevention work in various states.

[See also MINE-RESCUE APPARATUS.]

ACCIDENTS

After-Treatment of Injured Workmen. The After-Treatment of Injured Workmen at the North Staffordshire Massage Center, T. Lister Llewellyn. Colliery Guardian, vol. 120, no. 3112, Aug. 20, 1920, pp. 517-520, 15 figs. Employers of coal and iron industries are united in North Staffordshire district in mutual indemnity society, and "center" has been established and financed by them for free treatment of injured workmen in receipt of compensation. Number of workmen treated, average attendance and analyses of cases are given in tables.

Analysis. Analyzing Accidents to Reduce Them, H. W. Patton. Factory, vol. 25, no. 3, Aug. 1, 1920, pp. 370-371, 3 figs. Graphic charts showing causes and results of accidents, and when they occurred, are said to have proven valuable in safety program of Burroughs Adding Machine Co.

Building Trades. Accidents in Miscellaneous Building Trades. Contract Rec., vol. 33, no. 50, Dec. 10, 1919, pp. 1143-1146, 1 fig. Risks peculiar to sheet-metal workers, painters, electricians, plumbers, etc.

Coal Mines. See COAL MINES, Accidents.

Cost of. The High Cost of Things That Happen Unexpectedly, Sidney J. Williams. Factory, vol. 25, no. 7, Oct. 1, 1920, pp. 1043-1045, 4 figs. High cost of accidents is pointed out, and their prevention urged by more extended introduction of safety device in machinery.

Electric Plants. Accidents in Swiss Electric Plants (Ueber Unfälle an elektrischen Starkstromanlagen). Schweiz. Elektrotechnischer Verein Bul., vol. 11, no. 5, May 1920, pp. 107-113. Gives list of accidents occurring since 1909 with special mention of certain unusual accidents during last few years. States precautions to be observed with all apparatus used under dangerous conditions and in dangerous locations. Report of Committee of the Swiss Electrotechnical Assn.

First-Aid Regulations, British. First Aid at Factories. Eng. & Indus. Management, vol. 3, no. 7, Feb. 12, 1920, pp. 200-204, 2 figs. Gives summary of requirements of official regulations contained in circular issued by English Government, and suggests how effective service may be installed.

Frequency and Severity Rates. New Basis for Measuring Accident Frequency and Severity Rates. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 218-219. Committee on Statistics and Compensation Insurance Cost of Int. Assn. of Indus. Accident Boards and Commissions recommends that accident rates, both frequency rates and severity rates, be computed on basis of 1000 hr. exposure instead of 3000 hr. exposure.

Grade Crossings. Accidents at Railway Grade Crossings. Good Roads, vol. 18, no. 14, Oct. 1, 1919, pp. 164 and 169-170. Statistics on number of accidents occurring on public roads at railroad grade crossing and methods of prevention, discussed by Committee of Ry. Claim Agents' Organization.

Hospital Work in Shop. Hospital Work in a Large Machine-Tool Plant, Sanford De Hart. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 658-660, 3 figs. Experience of R. K. Le Blond Machine Tool Co., Cincinnati. Safety, sanitation and health work in that plant are under supervision of hospital department, personnel of which consists of the writer, a surgeon, a dentist and a stenographer.

Hours of Work and. See LABOR, Hours of Work.

Industrial. Industrial Accidents. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 151-165, 4 figs. Notes on influence of war on accident rates in iron and steel industry, 1914-1919, from a bulletin in preparation by Bur. of Statistics; coal-mine accidents in United States in six months ending Jan. 1920; and metal-mine accidents in United States during 1918.

The Cost of Industrial Accidents, Royal Meeker. Bul. Dept. of Labor & Industry, vol. 7, no. 4, 1920, pp. 24-31. Urges compiling of statistics.

Mines. Accidents on Haulage Inclines, V. Watteyne and L. Lebens. Quarry, vol. 25, no. 275, Jan. 1920, pp. 9-12, 7 figs. Recommendations in regard to details of pulleys and brakes. Translated from Annales des Mines de Belgique.

How Age and Occupation Affect Frequency and Duration of Disabilities, W. W. Adams. Coal Age, vol. 17, no. 25, June 17, 1920, pp. 1256-1258, 1 fig. Chart showing number of disability cases and of disability days for age

periods, computed from figures of insurance company.

State Owned Mines and Accident Frequency (Staatsbergbau und Unfallhäufigkeit), Ernst Jüngst. Glueckauf, vol. 55, no. 12, Mar. 22, 1919, pp. 207-209. Comparison between private operation and State operation of mines, in their relation to accident frequency.

See also Coal Mines; MINES, Accidents.

Plan of Control. A New Plan of Accident Control, David S. Beyer. Safety Eng., vol. 39, no. 4, Apr. 1920, pp. 173-178, 5 figs. Description of a system developed and put into practical operation by the Liberty Mutual Insurance Co. in several hundred plants, employing charts for recording rate of accidents in different industries. From Proc. of First Mass. Accident Prevention Congress.

Poisoning. See POISONING, Industrial.

Quarrying. See BLASTING, Accidents in.

Shafting and Belt Hazards. Shafting and Belt Hazards in the Cement Industry. Belting & Transmission, vol. 16, no. 3, Feb. 5, 1920, pp. 17-20, 4 figs. Compilation of accidents by Portland Cement Assn. and recommendations for prevention; value of education and mechanical guarding pointed out.

[See also HOSPITALS; WORKMEN'S COMPENSATION.]

ACCOUNTING

Billing by Machinery. Billing Machinery, G. W. Freeman. Natural Gas & Gasoline Jl., vol. 13, no. 12, Dec. 1919, pp. 417-423, 12 figs. How gas sales are billed by machinery in gas office.

Depreciation. Depreciation, Appreciation and Productive Capacity, W. A. Paton. Jl. Accountancy, vol. 30, no. 1, July 1920, pp. 1-11. Paper points out limitations inherent in accounting as a means of showing comparative economic well-being; shows that cost of replacement cannot be charged to expense except as conventional method of valuation is abandoned; and indicates that a revision of valuation policies could be adopted without distortion of any accounting fact.

Iron Mines. See IRON MINES, Accounting.

Power Plants. Keeping Books with the Power Plant, Robert June. Refrig. World, vol. 54, no. 11, pp. 25-26 and 35. To keep records of permanent specifications of all equipment, load demands, and costs of operation.

Public Utilities. Modern Journals for Corporation Accounting. Am. Gas Light Assn. Monthly, vol. 2, no. 7, July 1920, pp. 424-428, 4 figs. It is pointed out that concurrent with passage of laws in several states providing for establishment of commissions to govern and regulate business activities of utilities with respect to interstate commerce, these commissions were empowered with authority to prescribe system of accounts whereby various utilities were required to record financial transactions in manner which could easily be interpreted. Description of the various journals or accounting records referred to as schedules.

Taxation. The Amortization of War Facilities, Arnold F. Van Pelt. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 301-305. Suggestions as to definite procedure of value to those who have had war contracts.

Water Works. Water Works Bookkeeping and Accounting, Arthur F. Kaulfuss. Fire & Water Eng., vol. 67, no. 24, June 16, 1920, pp. 1311-1314, 18 figs. Describes system in use by water works of city of La Crosse, Wis., stage by stage, and gives illustrations of forms numbered consecutively in order of their use.

Woodworking Shops. Installing Management Methods in the Woodworking Industry, Carle M. Bigelow. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 470-477, 2 figs. Gives general plan for woodworking shop accounting, outlines various accounts, shows how they are compiled and interlocked and gives means and methods used for control.

[See also COST ACCOUNTING; RAILWAYS, Accounting.]

ACCUMULATORS

See STORAGE BATTERIES.

ACETALDEHYDE

See ACETYLENE, Acetic Acid from; GLYCERINE, from Sugar.

ACETATES

Hydrolysis. See HYDROLYSIS, Metal Acetates.

ACETIC ACID

Vapor Pressure of. The Effect of Salts on the Vapour Pressure and Degree of Dissociation of Acetic Acid in Solution. An Experimental Refutation of the Hypothesis that Neutral Salts Increase the Dissociation Constants of Weak Acids and Bases, James William McBain and James Kam. Jl. Chem. Soc., vols. 115 & 116, no. 686, Dec. 1919, pp. 1332-1346, 2 figs. Experiments are related which show that many salts enhance partial vapor pressure of acetic acid in aqueous solution by appreciable amounts. In case of 2.3N—sodium chloride, increase was found to amount to no less than 62 percent.

[See also ACETYLENE, Acetic Acid from.]

ACETONE

Analysis. The Analysis of Acetone by Messinger's Method, Leo Frank Goodwin. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 39-45. It is claimed that Messinger's method for analysis of acetone gives accurate and concordant results under proper conditions.

Losses in Preparation. Losses Incurred in the Preparation of Acetone by the Distillation of Acetate of Lime, Leo Frank Goodwin and Edward Tyghe Sterne. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 240-243, 1 fig. It was found experimentally that decomposition of calcium acetate by heat into acetone and calcium carbonate is almost quantitative, any gases formed arising through the decomposition of acetone in contact with heated walls of containers, or in case of commercial calcium acetate through decomposition caused by tarry impurities.

ACETYLENE

Acetic Acid from. The Conversion of Acetylene into Acetaldehyde and Acetic Acid (Die Ueberführung von Acetylen in Acetaldehyd und Essigsäure), B. Nermann and H. Schneider. Zeitschrift für angewandte Chemie, vol. 33, no. 62, Aug. 3, 1920, pp. 189-192, 3 figs. States best conditions for laboratory experiments. For conversion of acetylene into acetaldehyde, 30 deg. temperature with 96 deg. acetic acid is recommended.

Automobile Fuel. See AUTOMOBILE FUELS, Acetylene.

Compressing Plants. Tentative Regulations for the Installation and Operation of Acetylene Compressing Plants. Acetylene Jl., vol. 22, no. 2, Aug. 1920, pp. 82-84 and 86. Report of committee of National Fire Protection Assn., covering definitions, layout and location, construction, operation and machinery.

Explosion Prevention. Beechwood as Porous Permeable Material for Acetylene as Means of Preventing Back Travel of an Explosion (Buchen-

holz als poröser Durchgangsstoff für Acetylen als Mittel zur Verhinderung des Ruckschreitens einer Explosion). Acetylen, vol. 23, no. 1, Jan. 1920, pp. 2-4. Refers to an acetylene generator constructed by firm of J. Rössler, Carlsruhe, by use of which danger of explosion is eliminated by compelling the acetylene to pass through the pores of a beechwood block under its own pressure.

Generators. A New Acetylene Generator for Large Output (Ein neuer Acetylenentwickler für grosse Leistungen). Acetylen, vol. 23, no. 1, Jan. 1920, pp. 1-2, 1 fig. Apparatus constructed by the Sirius Autogenous Works, Ltd., in Eller, for manufacture of products requiring large quantities of acetylene.

Pressure Measurement. See OXYGEN, Pressure Measurement.

Spectrum of Flame. Distribution of Energy in the Spectrum of an Acetylene Flame. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 362, Feb. 12, 1920, pp. 639-651, 1 fig. Data on distribution of energy in infra-red spectrum of flat and of cylindrical acetylene flames. Article gives also revision of previously published spectral-energy data pertaining to violet and of visible spectrum.

[See also AUTOMOBILE FUELS, Acetylene; FLAME, Acetylene.]

ACETYLENE APPARATUS

Explosions. Apparatus for Preventing Explosions. Acetylene & Welding Jl., vol. 16, no. 191, Aug. 1919, pp. 156-157, 2 figs. Flame in gas conduit is arrested by utilizing heat of flame to melt quantity of fusible material in path of gas flow and thereby seal passage.

ACETYLENE WELDING

See OXY-ACETYLENE WELDING.

ACIDS

Fatty, Solubility of. Reciprocal Solubility Action of Fatty Acids (Ueber die gegenseitige Loslichkeits beeinflussung der Fettsäuren), P. Waentig und G. Pescheck. Zeitschrift für Physikalische Chemie, vol. 93, no. 5, Sept. 26, 1919, pp. 529-569, 6 figs. It is pointed out that solubility of a fatty acid is considerably increased in certain solvents by presence of another solvent and that this increase is reciprocal. Water is said to have a strong influence on solubility, which, however, is not affected by temperature. Melting diagram of palmitin and laurin acids is presented which is said to demonstrate that these acids also combine in solid state, forming 1 mol palmitin acid and 1 mol laurin acid.

Pumping, Compressed-Air. Pumping Acid with Compressed Air, John Oliphant. Chem. & Met. Eng., vol. 22, no. 9, March 3, 1920, pp. 408-410, 6 figs. Advantages of air-lift system for handling and transferring acids as compared with mechanical pumps and as demonstrated by actual installations.

ACOUSTICS

Stringed Instruments. On the Partial Tones of Bowed Stringed Instruments, C. V. Raman. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 573-581, 5 figs. Discussion of variation of amplitudes and phases of partial vibrations with positions of bowed point within musical range of bowing.

ACTINIUM

Source of. The Source of Actinium (Der Ursprung des Actiniums), Otto Hahn and Lise Meitner. Physikalische Zeitschrift, vol. 20, no. 23, Dec. 1, 1919, pp. 529-533. The relative activity of the proto-actinium in pitch blende is determined by separating the proto-actinium under various conditions and comparing its alpha-radiation with that of uranium.

ACTIVATED SLUDGE

See SEWAGE DISPOSAL, Activated Sludge.

ADDING MACHINES

Electric. New Type of Arithmometer (L'Arithmométre de M. Torrès y Quevedo), H. Vigneron. Nature (Paris), no. 2418, Aug. 7, 1920, pp. 89-93, 6 figs. Machine effects automatically the classic arithmetical operations. It is operated by electricity.

Manufacture. The Manufacture of Adding Machines. Eng. Production, vol. 1, no. 2, Feb. 1920, pp. 75-82, 26 figs. Methods employed at works of Burroughs Adding Machine Co., Nottingham, England, where output exceeds 2,000 machines per year.

Paris Exposition. Adding Machines at Exposition of the Société d'Encouragement held in Paris from June 5 to June 13, 1920 (L'exposition de machines a calculer de la Société d'Encouragement, Paris, 5-13 juin 1920), Eugene Lèmaire. Génie Civil, vol. 77, no. 8, Aug. 21, 1920, pp. 156-158. Review of exhibits.

ADSORPTION

See GASES, Adsorption.

AERIAL BOMBARDMENT

Manual on. Aerial Bombardment Manual I. Air Service Information Circular, vol. 1, no. 54, May 21, 1920, 12 pp. Based on French and English bombarding school schedules as well as those of Am. Ex. Forces Bombing School at Clermont-Ferrand in France and Am. Bombing School at Ellington Field, Texas.

AERIAL NAVIGATION

See AVIATION.

AERIAL PHOTOGRAPHY

Automatic Camera. The Fairchild Automatic Aerial Film Camera, Herbert E. Ives. Aerial Age, vol. 10, no. 20, March 1, 1920, p. 728, 2 figs. Improvement of K automatic film camera adopted by U. S. Air Service by addition of one lens shutter, film-spacing device and exposure-interval mechanism.

Chart Drawing. Aerial Photography for Topographical Precision Work and Particularly for Making the Register of Real Property of a Region (La photographie Aérienne appliquée aux travaux topographiques des précision et en particulier a la réflection du cadastre). A. Guillemet. Revue générale des Sciences, vol. 31, no. 10, May 30, 1920, pp. 313-319, 3 figs. Roussilhe method of drawing charts from aerial photograph.

Cinematograph for Surveying. Automatic Cinematograph for Aerial Surveying, Alfred Gradenwitz. Aviation, vol. 9, no. 1, Aug. 1, 1920, pp. 24-25, 6 figs. Description of series topograph outfit and examples of what has been accomplished with it.

Detection of Objects. A Photographic Method of Detecting Changes in a Complicated Group of Objects, M. H. Stillman. Dept. of Commerce, Sci. Papers, Bur. of Standards, no. 392, July 31, 1920, pp. 437-448, 9 figs. Method involves superposition of two photographs taken at different intervals. It was developed for use in military operations.

Geographical and Geological Research. Aircraft Photography in the Service of Science, H. Hamshaw Thomas. Nature, vol. 105, no. 2641, June 10, 1920, pp. 457-459, 3 figs. Examples of applications of aerial photography in geographical and geological research.

Mapping. See MAPPING, Aerial Photography.

Surveying. See SURVEYING, Aerial Photography.

Topographical Surveys. Aerial Photography as Applied to Topographical Surveys, J. B. Mandeville. Aerial Age, vol. 2, no. 3, Mar. 29, 1920, pp. 87-88, 4 figs. Basic surveys made in western Pennsylvania by aerial photography are said to have demonstrated that this method of surveying reduces cost from 25 to 40 per cent and permits work to be done in much shorter time.

Uses. Aerial Photography (Sur la photographie aérienne), Jean-Abel Lefranc. Aérophile, vol. 28, nos. 13-14, July 1-15, 1920, pp. 204-208, 6 figs. Uses are pointed out and structural details of equipment are discussed.

Aerial Photography in War and in Peace (La photographie aérienne, arme de guerre, outil de la paix), Henry Bouche. Bulletin de la Société d'Encouragement pour l'Industrie nationale, vol. 132, no. 4, July-Aug. 1920, pp. 464-488, 9 figs. Surveys applications of aerial photography in topographical work, and visualizes future developments.

The Economic Utilization of Aerial Photography (Die wirtschaftliche Ausnützung der Luftbildtechnik), Kurt-Alex Büttner. Luftfahrt, vol. 24, no. 7, July 1920, pp. 101-102, 1 fig. Points out advantages of the aerial photograph for future land as well as air traffic.

AERIAL ROPEWAYS

See CABLEWAYS, Timber Transportation.

AERIAL TRAMWAYS

See CABLE TRAMWAYS; CABLEWAYS.

AERIAL TRANSPORTATION

See AVIATION, Aerial Transportation.

AERIALS

See RADIOTELEGRAPHY, Aerials.

AERODROMES

Preparation of. Preparation of Aerodromes, W. T. Blake. Aeronautics, vol. 18, no. 328, Jan. 29, 1920, pp. 106-107. Conditions to which landing grounds should comply, as outlined in reports of Civil Aerial Transport Committee of British Government.

Sewerage of. Sewerage and Sewage Disposal of Aerodromes, D. Balfour. Surveyor, vol. 58, no. 1487, July 16, 1920, pp. 39-40. Work carried on during war in naval and military aerodromes, comprising gravitation and pumping schemes, discharges into corporation sewers and tidal waters.

United Kingdom. Aerodromes for Civil Use. Aeronautics, vol. 19, no. 355, Aug. 5, 1920, p 121-123. List giving aerodromes and landing grounds open to civil aviation in United Kingdom and location of service and civil stations which are available to civil aircraft in case of emergency.

AERODYNAMICS

Load and Resistance Equations. Reports of the Research Laboratory for Aerodynamics at Göttingen—III (Mitteilungen aus der Göttinger Modellversuchsanstalt für Aerodynamik), C. Wieselsberger. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, no. 9 & 10, May 31, 1919, pp. 93-95, 2 figs. Equations for determination of load, volume and resistance of wings.

Streamline Bodies, Fluid Resistance on. Fluid Resistance on Bodies of Approximately Streamline Form, J. R. Pannell. Aeronautical Jl., vol. 24, no. 117, Sept. 1920, pp. 498-504, 3 figs. Attention is directed chiefly to case where only properties of fluids upon which motion depends are viscosity and density, though brief mention is made of instances where acceleration due to gravity is important.

Testing Station. Model Aerodynamic Testing Station in Göttingen (Die Modell-Versuchsanstalt für Aerodynamik in Göttingen), L. Prandtl. Zeitschrift für Flugtechnik u. Motoluftschiffahrt, vol. 11, no. 6, Mar. 31, 1920, pp. 84-87, 4 figs. New building is of reinforced concrete equipped with a traveling crane and containing a wind tunnel of reinforced concrete, placed in vertical position, arrangement being copied from the Eiffel plant in Paris, with certain changes. A 300-hp. d.c. motor serves as drive for blower. Testing devices are mounted on car wheels and can be easily moved about on track.

Theorem of Variation of Motion. The Theorem of Variation of Motion Applied to Fluid in Equilibrium (Le théorème de la variation des quantités de mouvement appliqué au régime permanent des fluides), Herman Chauvin. Revue universelle des Mines, vol. 5, no. 6 and vol. 6, no. 2, June 15 and July 15, 1920, pp. 433-494 and 81-121, 41 figs. Determination of thrust exerted on apparatus setting in motion, in unit of time, known mass of fluid at known velocity.

[See also MANOMETERS, Multiple-Tube; WIND TUNNELS.]

AEROFOILS

See AEROPLANES, Aerofoils.

AERONAUTICAL INSTRUMENTS

Accelerometer. Notes on the Theory of the Accelerometer, E. P. Warner. Aerial Age, vol. 11, no. 20, July 26, 1920, pp. 681-682. Discusses errors and means for reducing them to a minimum and takes up equations of motion, deducing from them lag in responding to shocks, damping of the sensitive member, and possible errors due to resonance with vibrations of aeroplane engine.

Construction, Testing and Use. Aeronautic Instruments, Mayo D. Hersey. Mech. Eng., vol. 42, no. 5, May 1920, pp. 263-268, 4 figs. Paper on general principles of their construction, testing and use, based on work of Aeronautic Instruments Section of Bur. of Standards.

Curve Indicators. Curve Indicators (Les indicateurs à courbes), H. Petit. Technique Automobile et Aérienne, vol. 2, no. 109, second quarter, 1920, pp. 45-51, 7 figs. Principle of operation and construction of two-needle indicators.

Flight Indicators. Aerial Flight Indicators (Flugzeug-Steuerzeiger), A. Neuburger. Verkehrstechnik, no. 4, Feb. 5, 1920, pp. 51-53, 4 figs. Design and operation of apparatus developed by Director Drexler of the Gyroscope Construction Co., Ltd., which indicates deviations from direct flight, records inclination, radius and direction of traveled curve, and at same time, actual speed and height above earth surface.

Pitot-Static Tube. Comparison of U. S. and British Standard Pitot-Static Tubes, A. F. Zahm and R. H. Smith. National Advisory Committee for Aeronautics, Report No. 81, 4 pp., 6 figs. Test showed that air speed readings of the two instruments are identical to the accuracy of indication of either instrument.

Rate-of-Climb Indicators. Rate-of-Climb Indicators. Air Service Information Circular, vol. 1, no. 31, April 13, 1920, 3 pp., 8 figs. Different types of instruments are named and described. Theory of instruments is explained by formulæ.

Telecompass. The Telecompass (Der Fernkompass), Walter F. Friedensburg. Zeitschrift für

Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 15, Aug. 14, 1920, pp. 217-220, 9 figs. Describes new type of compass which can be located as far as possible from the influence of iron masses and whose indications are transmitted to conveniently located instruments from which they can be read.

Turn Indicators. The Pioneer Turn Indicator, Charles H. Colvin. Aviation, vol. 8, no. 7, May 1, 1920, pp. 283-284, 5 figs. Operates by force obtained from reaction of small gyroscope to turning movement of plane.

The Static Head Turn Indicator for Aeroplanes, Horace Darwin. Flight, vol. 11, no. 44, Oct. 30, 1919, pp. 1429-1431. Also in Sci. Am. Supp., vol. 88, no. 2288, Nov. 29, 1919, pp. 322-323, and Aeronautics, vol. 17, no. 315, Oct. 30, 1919, pp. 410-412. Instrument designed to indicate whether under all conditions path of aeroplane is straight line or whether machine is turning to right or left.

AERONAUTICS

Air Resistance. The Resolution of Oblique Wind-Pressure Forces and the Dines Pressure Plane (Die Zerlegung der Kräfte bei schiefem Winddruck und der Dienessche Höcker), H. Haedicke. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 40, Oct. 4, 1919, pp. 983-985, 7 figs. Writer calls attention, with aid of Föppl's values, to incorrectness of formulæ for air resistance now in use, and suggests others. He further discusses nature of air resistance and explains working of the Dines pressure plane.

British Advisory Committee for Aeronautics. Some Points of Importance in the Work of the Advisory Committee for Aeronautics, R. T. Glazebrook. Aeronautics, vol. 18, nos. 346 and 347, June 3 and 10, 1920, pp. 435-437 and 450-452, 1 fig. Also in Aeronautical Jl., vol. 24, no. 117, Sept. 1920, pp. 479-488 and (discussion) pp. 489-495, 1 fig. History and work of Advisory Committee for Aeronautics of Great Britain with considerations on problems which await solution and which will have to be undertaken by the new Aeronautical Research Committee. Paper read before Royal Aeronautical Soc.

Camouflage. Aeronautical Camouflage, Wm. H. Weigler. Aerial Age, vol. 11, no. 9, May 10, 1920, pp. 288-289 and 300, 5 figs. Experiments at McCook field on model aeroplanes. Camouflage design is explained which is said to accomplish invisibility at 15,000 ft. of plane normally invisible at 20,000 ft. Curve plotted by Bureau of Standards, which shows, in terms of wave length of light and amount of transmission, effect of visibility of various colors, is included.

Canada. Canada's Plan for Control and Development of Aeronautics, Allen Sinsheimer. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 701-703. Original draft of recently established Air Board for control of aeronautics.

Commercial. Commercial Aerial Navigation (La navigation commerciale aérienne), Emile Gouault. Génie Civil, vol. 75, no. 17, Oct. 25, 1919, pp. 391-394, 3 figs. Its possibilities. Reference is made to development in Great Britain and Germany.

Direction Finding. See DIRECTION FINDERS.

Federation Aeronautique Internationale. Federation Aeronautique Internationale, Harold E. Perrin. Aeronautics, vol. 19, no. 362, Sept. 23, 1920, p. 222. Notes on Conference held in Geneva on Sept. 8, 9 and 10.

France. France Adopts Definite Plan to Promote Aircraft, Allen Sinsheimer. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 653-654. Department of Aeronautics created to supervise domestic regulations and award subsidies and premiums.

Present Progress of Aeronautics in France (L'état actuel de l'aéronautique en France), Emile Cougault. Génie Civil, vol. 77, no. 1, July 3, 1920, pp. 11-13. Figures comparing characteristics of aeroplanes built in 1914 and in 1919. It is noted, for instance, that greatest speed obtainable on the ground was 130 km. per hr. in 1914 and 240 km. per hr. in 1919; maximum cruising radius with two men on board was 500 km. in 1914 and 2000 in 1919; maximum power was 130 hp. in 1914 and 1000 in 1919.

Government Control. A Bill to Create a Department of Aeronautics, Allen Sinsheimer. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 999-1001 and 1033. Draft of bill to create Department of Aeronautics.

Civilian Aviation Control Favored by General Staff, Allen Sinsheimer. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 949-958, 1 fig. Committee of major generals appointed to investigate New and Curry Bills suggests creation of Department of Aeronautics leaving activities of Army and Navy under those departments.

Italy. Aeronautics in Italy (L'aéronautique en Italie). Aéronautique, vol. 1, no. 6, Nov. 1919, pp. 216-226, 6 figs. Particulars of principal types developed and notes on present organization of civil aeronautics.

Lexicon. Technical Terms in Aeronautics (Flugtechnische Fachsprache). E. Everling. Motorwagen, vol. 22, no. 34, Dec. 10, 1919, pp. 647-652. Gives German equivalents for large number of English aeronautical terms. Report from German Experimental Station for Aerial Traffic.

Lifting Surfaces, Theory of. Theory of Lifting Surfaces, L. Prandtl. Aeronautics, vol. 19, nos. 358 and 359, Aug. 26 and Sept. 2, 1920, pp. 164-165 and 185-186. Aug. 26: Formulæ establishing relation between distribution of lift along span, configuration and resistance of wing. Sept. 2: Theory of multiplanes. Translated from the German.

McCook Field and. McCook Field and American Aeronautics, Leon Cammen. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 441-444, 6 figs. Inception of McCook Field and nature of work carried on. Problem of variable-pitch propeller. Development of measuring instruments. Research work in altitude flying. Present and future potentialities of field.

Military. See Camouflage.

Naval Architecture in. Naval Architecture in Aeronautics, Jerome C. Hunsaker. Flight, vol. 12, nos. 27, 31, 32 and 33, July 1, July 29, Aug. 1 and Aug. 12, 1920, pp. 692-695, 844-846, 866-868 and 888-891, 24 figs. Also Eng., vol. 109, no. 2843, June 25, 1920, pp. 857-860, 9 figs; Aeronautical Jl., vol. 24, no. 115, July 1920, pp. 321-405, 40 figs.; and Aeronautics, vol. 19, no. 350, July 1, 1920, pp. 9-12. Gives weight data for machines supposed to represent successful designs of adequate strength and power, eliminating all that are weak structurally or grossly underpowered, etc.; data summarized on charts to furnish guide for use in preliminary design; and general conclusions arrived at with regard to weight. Annual Wilbur Wright lecture at Central Hall, Westminster.

Nomenclature. Nomenclature for Aeronautics. Nat. Advisory Committee for Aeronautics, Report no. 91, 1920, 41 pp., 20 figs. on three supp. plates. Nomenclature and list of symbols approved by Executive Committee of National Advisory Committee for Aeronautics.

Problems. Present Problems of Aeronautics (Les

problèmes actuels de L'aéronautique). L'Aeronautique, no. 7, Dec. 1919, pp. 279-314, 46 figs. Tendencies in design of airships in various countries are analyzed and future developments of airship design are visualized. Present applications and future developments of wireless-telegraphy apparatus for aeroplane and airship service, and progress in designing of parachutes are also taken up.

Progress in 1919. Aeronautics in 1919. Engineer, vol. 129, nos. 3340 and 3341, Jan. 2 and 9, 1920, pp. 5-8 and 31-36, 16 figs. In spite of passage of Atlantic by seaplane and aeroplane and double trip across same ocean by airship, opinion is expressed that "the past twelve months failed very considerably to come up to the expectation formed for them a year ago," and that in spite of very considerable progress in design and construction of aeroplanes "civil aviation has undoubtedly failed so far to go ahead with the vigor at one time expected of it by many people."

Research. Education and Research in Aeronautics. Flight, vol. 12, no. 9, Feb. 26, 1920, pp. 245-248. Report of Committee on Education and Research in Aeronautics appointed to consider what steps should be taken to organize education and research in aeronautics after the war. Committee recommends that an Aeronautical Research Committee should be constituted in connection with Air Ministry, and that encouragement should be given to establishment of Industrial Research Association for Aeronautical Industry.

The Advisory Committee for Aeronautics. Flight, vol. 12, no. 17, Apr. 22, 1920, pp. 439-442. Summary of work done by British Advisory Committee for Aeronautics for 1918-1919, noting specially expansions which have been necessitated in experimental work in order to cope with demands from Royal Air Force and British aeronautical industry.

Status in United States. Invention in Aeronautics, Frederick W. Barker. Sci. Am. Monthly, vol. 1, no. 3, Mar. 1920, pp. 202-204. It is noted that in spite of America's "brilliant initiative in blazing the way for flight by man," she "fell behind other nations in progressive work, while England, France and Italy produced advanced examples of flying machines," and that at present "she is behind other nations in the production of up-to-date passenger and merchandise-carrying machines." Paper read before Aeronautical Soc. of America.

Symbols. See SYMBOLS, Aeronautical.

Work of U. S. Army. Aeronautics in the United States, George O. Squier. Jl. Soc. Automotive Engrs., vol. 5, no. 6, Dec. 1919, pp. 402-414, 6 figs. Account of work done by Division of Aeronautics of U. S. Army, together with exposition of reasons and tests which determined selection of models subsequently built in large quantities, and notes on commercial production of helium, and summary of results actually achieved by Signal Corps Research Division.

[See also AEROPLANES; AIRCRAFT; AIRSHIPS; AVIATION; AVIATORS, Physiology of; CLINOMETERS; FLIGHT; METEOROLOGY; RADIO COMMUNICATION; NAVAL AIRCRAFT.]

AERONAUTS

See AVIATORS.

AEROPLANE ENGINES

Aeromarine. Aeromarine Eight Cylinder B Type Motor, W. C. Bauer. Aviation, vol. 8, no. 1, Feb. 1, 1920, pp. 23-24, 4 figs. Specifications: 8 cylinders, 3⅞-in. bore, 5⅛-in. stroke; 423 cu. in. total volume; 5⅓ to 1 compression ratio; 4 to 7 gear ratio; 420-lb. total weight—dry motor complete with all accessories; 1 to 3.44 ratio valve area to piston area and 1 to 18.75 ratio valve area to piston displacement.

Altitude Operation. Report on Variation of Horse-Power with Temperature. Aeronautics, vol. 17, no. 310, Sept. 25, 1919, pp. 308-313, 11 figs. Tests covering altitudes from 2000 ft. to 30,000, with engine being fitted successively with Clandel, Stromberg and Tice carburetors. U. S. Bur. of Standards Aeronautic Power Plants Report No. 8.

See also High-Altitude Operation.

Aluminum Alloys for. See ALUMINUM ALLOYS, Aeroplane-Engine.

Armstrong. See British.

Bayerische Motoren Werke. The B. M. W. Aero Engines. Aerial Age, vol. 12, no. 1, Sept. 13, 1920, pp. 14-15 and p. 18, 9 figs. Supercompression high-altitude engines. Notable feature is that r.p.m. of propeller increase with increasing height. Up to normal output of 220 hp. propeller is coupled directly to crankshaft; more powerful types have specially designed reduction gear.

Benz. Standard Engine Report on the Six-Cylinder Benz Aviation Engine Rated at 200 hp. at 1400 r.p.m. Air Service Information Circular, Eng. Div., Air Service, vol. 1, no. 41, May 8, 1920, 35 pp., 29 figs. It is concluded that performance of engine is good, although not exceptional. Cylinder construction, valve gear, fuel pump, bearing, cooling, and methods used to obtain compactness could well be applied to American service engines.

The 300-Hp. Benz Aeroplane Engine (Der 300 PS-Flugmotor von Benz & Cie, A.-G., Mannheim), A. Heller. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 2, Jan. 10, 1920, pp. 35-42, 34 figs. Characteristics: 12 cylinders of 135 mm. diam. and 500 mm. stroke; speed, 1800 r.p.m.; aluminum pistons with cast-in steel pin bearings; double piston rods of tubular section; automatic fuel pumps, etc.

British. British Engines at the Paris Show. Flight, vol. 11, no. 52, Dec. 25, 1919, pp. 1651-1654, 9 figs. Notably 40-hp. Armstrong, 500-hp. Cosmos Jupiter, 450-hp. Napier and 800-hp. Sikh.

Camshafts. See Fiat.

Cannon Geared to. See CANNON.

Carburetors. See Fiat; CARBURETORS.

Cato. The Cato 72 H.P. Aero Engine. Aerial Age, vol. 10, no. 2, Sept. 22, 1919, pp. 57-58, 3 figs. Two-cylinder, horizontally opposed, four-cycle, air cooled valve-in-head type. Bore, 5-in.; stroke, 6-in.; piston displacement, 235.63 cu. in.; compression ratio, 433-1; weight complete, 134 lb. Rated horsepower is 72 at 1825 r.p.m.

Clerget. The International Aero Exhibition. Eng., vol. 110, nos. 2846 and 2848, July 16 and 30, 1920, pp. 74-79 and p. 82, 12 figs., and 137-142, 8 figs. Details of models exhibited and of Clergat and Zeitlin engines.

Connecting Rods. Assembling Liberty Motor Connecting-Rods, H. A. Carhart. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 995-998, 6 figs., and vol. 52, no. 2, Jan. 8, 1920, pp. 89-92, 4 figs. Methods of testing alignment and clearances. Points out difficulties of handling chrome-nickel steel and shows how rods were heat-treated and tested.

See also Liberty.

Construction. See Liberty.

Construction Materials. High-grade Construction Materials (Hochwertige Werkstoffe), F. Kretzschmar. Schiffbau, vol. 21, nos. 17-18 and 19-

20, Mar. 17-24 and Mar. 31-Apr. 7, 1920, pp. 519-523 and 556-561, 4 figs. Notes on materials used in construction of light engines, such as those for automobiles, dirigibles and aeroplanes, giving mechanical and chemical properties of high-grade steels, of aluminum and electron metal, and their treatment during preparation.

Cooling Systems. See Radiators.

Cosmos Jupiter. See British.

Crankcases. Turret Lathe Practice, Alfred Herbert. Machy. (Lond.), vol. 15, no. 386, Feb. 19, 1920, pp. 645-652, 14 figs. Examples of production methods employed on crankcases and other aero-engine details.

Crankshafts. Built-Up Crankshafts. Auto, vol. 25, no. 4, Jan. 22, 1920, pp. 103-104, 4 figs. Constructional features of Canton-Unné, Anzani and W. J. P. Moore types.

Curtiss. See Types.

Cylinders. Water-Cooled Aeroplane-Engine Cylinders (Wassergekühlte Flugmotoren-Zylinder), H. Praetorius. Motorwagen, vol. 23, no. 12, Apr. 30, 1920, pp. 197-201, 12 figs. Describes various examples of a new type of steel cylinder in which the walls of water jacket are of thin plate instead of the thicker cast iron, are therefore lighter of weight, and an exchange of heat is more easily obtained whereby a saving in weight of radiator and cooling water can be effected.

Design. Best Density of Cylinder Charge for Aeroplane Engines (Sur le choix de la densité de remplissage dans la conception des moteurs d'aviation à explosions), Jean Villey. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 25, June 21, 1920, pp. 1484-1486. General considerations of engine design for high-altitude flying.

Calculation of Motors for Aviation Purposes (Ueber die Berechnung der Höhenmotoren), Weisshaar. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 11 and 12, June 28, 1919, pp. 125-127, 4 figs. Curves and equations.

European Aircraft Trend is Toward Large Water-Cooled Engines. Automotive Industries, vol. 42, no. 9, Feb. 26, 1920, pp. 554-559, 13 figs. Power units with fixed cylinders numbering more than six are said to have been predominant at Paris aeronautical exhibition. Designs are examined from critical standpoint of future development.

Lines Along Which Seaplane Motors Should be Developed (Richtlinien für die Entwicklung eines Motors für Seeflugzeuge), Fuhrberg. Motorwagen, vol. 22, no. 23, Aug. 20, 1919, pp. 412-417, 3 figs. Horsepower, continuous operation, fuel consumption, material to be used and construction are main points discussed.

Reflection of the Paris Aero Show, W. F. Bradley. Autocar, vol. 44, no. 1263, Jan. 3, 1920, pp. 3-11, 27 figs. Outstanding features of engine design, specially as regards cooling, valves and valve operation.

The Present-Day Problems of Aerial Propulsion (Die heutigen Probleme des Flugzeugantriebes), K. Kutzbach. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 13-14, Apr. 3, 1920, pp. 304-307, 3 figs. Discussion of the various means of reducing weight of aeroplane engines and of the fuel per hp.-hr.

Developments. Modern Aviation Engines, K. H. Condit. Am. Mach., vol. 53, no. 14, Sept. 30, 1920, pp. 616-618, 5 figs. Survey of developments.

Developments During War. Aviation Motors (Les moteurs d'aviation), M. Martinot-Lagarde. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs civils de France, nos. 10-12, Oct.-Dec., 1919, pp. 515-549, 9 figs. Evolution during the war.

Diesel Type. A Twin Piston Diesel Engine Designed for Use in Aircraft. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 718-719, 5 figs. Two-stroke cycle Diesel engine developed in Germany on Oechelhauser opposed piston principle.

Engine Speed and Speed of Flight. Variation of Airplane Engine Speed with Speed of Flight, Edward P. Warner. Automotive Industries, vol. 42, no. 4, Jan. 22, 1920, pp. 310-313, 3 figs. Illustrates method of determining r.p.m. for series of values of V from curve of torque coefficient.

Fiat. The Fiat 600 hp. Aircraft Engine, Neil MacCoull. Aviation, vol. 7, no. 11, Jan. 1, 1920, pp. 481-486, 12 figs. Principal data are: Bore, 6.693 in.; stroke, 8.268 in.; clearance volume, 73.23 cu. in.; compression ratio 4.967; horsepower, rated 600 at 1500 r.p.m.; weight per hp. dry, 2.68 lb.

Two New Fiat Aero Engines. Flight, vol. 12, no. 5, Jan. 29, 1920, pp. 126-127, 3 figs. A-15 R. 400-hp. 12-cylinder "V" and A-18 300-hp. 9-cylinder radial water-cooled type.

The 650 H.P. Fiat Aircraft Engine. Aerial Age, vol. 10, nos. 16 and 17, Feb. 2 and 9, 1920, pp. 597-599, 5 figs., and 629-631, 7 figs. Feb. 2: Engine is 12-cylinder, V-type, water-cooled, of 177 mm. bore and 210 mm. stroke, ungeared, and is designed to run at medium speed. Notable features of engine are design of valve gear and camshafts and camshaft driving gear. Feb. 9: Carburetors and ignition system.

500-Hp. New Aircraft Engine Developed from the Liberty Twelve. Automotive Industries, vol. 43, no. 3, July 15, 1920, pp. 104-105, 2 figs. Description of a 500-600 hp. engine with four valves per cylinder designed for high-speed work.

Fuel Charge. Choice of Density of Fuel Charge in the Design of Aeroplane Engines (Sur le choix de la densité de remplissage dans la construction des moteurs d'aviation à explosion), Jean Villey. Aérophile, vol. 28, nos. 11-12, June 1-15, 1920, pp. 173-177. It is argued that aeroplane engines must be designed along special principles of their own, and not, as it has been done, by applying principles of design of automobile engines. Procedure is suggested.

Fuel Consumption. The Fuel and Oil Consumption of Automobile and Aeroplane Engines (Die Brennstoffund Oelverbrauchsmessung von Fahrzeug- und Flugmotoren), K. Fr. Nägele. Motorwagen, vol. 22, no. 36, Dec. 31, 1919, pp. 687-693, 22 figs. Description of the Seppeler apparatus.

Fuel Economy. Simple Method for Saving Fuel in Aerial Traffic (Einfache Mittel zur Brennstoffersparnis bei Verkehrsflügen), E. Kook. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 17 and 18, Sept. 27, 1919, pp. 183-185, 5 figs. Writer maintains that by flying with throttled motor and reduced speed, amount of fuel required can be greatly diminished.

Fuels. A New Process for the Production of Aircraft Engine Fuels, Auguste Jean Paris, Jr., and W. Francklyn Paris. Aerial Age, vol. 10, no. 13, Jan. 12, 1920, pp. 497-498, 2 figs. Also Gas Engine, vol. 22, no. 1, Jan. 1920, pp. 24-25. Developed at experimental plant of Nat. Advisory Committee for Aeronautics.

An Investigation of Airplane Fuels, E. W. Dean and Clarence Netzen. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 537-538. Summary of investigations by U. S. Bur. of Mines.

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Benzole as a Fuel for Aircraft Engines. Automobile Engr., vol. 9, no. 133, Dec. 1919, pp. 446-448, 11 figs. Power characteristics of 20 per cent mixture. Report issued by Bur. of Standards.

New Process for the Production of Aircraft Fuels, Auguste Jean Paris, Jr., and W. Francklyn Paris. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 133-134, 2 figs. Report no. 42, National Advisory Committee for Aeronautics.

Power Characteristics of Fuels for Aircraft Engines. Nat. Advisory Committee for Aeronautics, report no. 47, 1920, 35 pp., 30 figs. Tests made to determine gasoline or gasolines giving maximum power. Tests proved that any of gasolines used can be made by proper "carbureting" to give same power within range of order of 5 per cent. It is probable that relative merits of fuels of commercial and war uses depend upon economy more than upon power ability.

Qualities of Gasoline for Aviation Motors (Les qualités de l'essence pour moteurs d'aviation), A. Grebel. Génie Civil, vol. 75, no. 21, Nov. 22, 1919, pp. 517-519, 3 figs. Characteristics of fuel fixed in September 1917 by Service d'Aeronautique militaire.

See also AUTOMOBILE FUELS; GASOLINE, Alcogas vs. Aviation Gasoline.

Gas Turbines. See GAS TURBINES, Aeronautical.

German Types. Development of German Aircraft Engines, Otto Schwager. Aviation, vol. 9, no. 5, Oct. 1, 1920, pp. 161-164, 9 figs. Extract from lecture given at General Meeting of Sci. Assn. for Technics of Aviation at Hamburg, April 19, 1918. Translated from Technische Berichte.

Gnome Monosoupape. Turret Lathe Practice, Alfred Herbert. Machy. (Lond.), vol. 15, no. 389, Mar. 11, 1920, pp. 745-750, 9 figs. Machining operation of piston of Gnome monosoupape aero-engine.

Hall-Scott. See Types.

High-Altitude Operation. A New Engine-Testing Plant, R. S. McBride. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1061-1063. Description of plant of Bur. of Standards, with special reference to apparatus used when testing airplane engines for simulating conditions encountered at high altitudes.

Construction of High-Output Aeroplane Engines for High Altitudes (Konstruktionserwägungen über Höhen-Volleistungsmotoren), F. Ernst Bielefeld. Motorwagen, vol. 23, no. 2, Jan. 20, 1920, pp. 33-37, 18 figs. Details and illustrations of various types of 2-stroke and 4-stroke engines and devices for testing engines under variable atmospheric pressure, etc. Curves are given which show output and fuel consumption of high-output engines at high altitudes.

Flight at High Altitudes (Sur les vols aux hautes altitudes), Jean Villey. Comptes rendus des séances de l'Académie des Sciences, vol. 170, no. 16, April 19, 1920, pp. 924-927. Notes on oversized aeroplane engines.

Hispano-Suiza. Standard Report on the 300-hp. Hispano-Suiza Aviation Engine with Steel Cylinders. Air Service Information Circular, Eng. Div., Air Service, vol. 1, no. 64, May 29, 1920, 14 pp., 10 figs. Tests could not be carried to satisfactory conclusion because of lack of parts, but indicated that power is less and fuel economy poorer with this type than with model H.

Standard Engine Report Hispano-Suiza Model "H" 300 H.P. Eng. Division Air Service. Technical Orders, no. 14, March 1920, pp. 14-44, 21 figs. Specifications: number of cylinders, 8; stroke-bore ratio, 1.07:1; piston displacement per cylinder, 140.8 cu. in.; compression volume, 32.6 cu. in.; compression pressure, 102 lb. at 120 r.p.m.; total weight, 632 lb. Test results are included.

The Hispano-Suiza Airplane Engine, H. C. Isenberg. Am. Mach., vol. 51, nos. 20 and 24, Nov. 13-20 and Dec. 25, 1919, pp. 849-856, 24 figs., and 1051-1056, 25 figs. Nov. 13-20: Details of different types of connecting rods are given and a few of major operations are illustrated and described. Illustrations are also shown of rods in various stages of their manufacture. Dec. 25: Crankshaft, crankcase, camshaft and piston; notes on details, operations and assembling.

The 37-80 Hp. Six-Cylindered Hispano-Suiza. Auto, vol. 25, no. 14, Apr. 1, 1920, pp. 360-362, 8 figs. Description of what is said to be one of the most highly-elaborated after-war French models of an already famous mark.

See also Types.

Horsepower and Altitude. See Power and Altitude.

Ignition. See Fiat; IGNITION, MAGNETOS.

Indicator Diagrams, Calculation of. Calculation of Low-Pressure Indicator Diagrams. Nat. Advisory Committee for Aeronautics, report no. 50, 1920, 13 pp., 7 figs. Method of computing theoretical low-spring diagrams is developed. It is assumed that mixture of air, burnt gas, and fuel in cylinder behaves as perfect gas and that processes involved are all adiabatic.

Inspection. Aeroplane Engine Inspection. Aerial Age, vol. 10, no. 12, Jan. 5, 1919, pp. 460-461. Suggestions for making it.

Intake Manifolds. Designing a Compact Intake Manifold. Automotive Industries, vol. 43, no. 9, Aug. 26, 1920, pp. 416-417, 4 figs. Design of intake manifold used in Liberty six aircraft engine.

International Exposition. Aero-Engines at the Crystal Palace. Flight, vol. 12, nos. 33 and 34, Aug. 12 and 19, 1920, pp. 884-887 and 904-906, 14 figs. Review of developments with special reference to German models exhibited.

The International Aero Exhibition. Automobile Engr., vol. 11, no. 141, Aug. 1920, pp. 319-322, 13 figs. Notes on engines exhibited.

The International Aero Exhibition. Eng., vol. 110, no. 2847, July 23, 1920, pp. 106-109 and p. 118, 9 figs. partly on 2 supp. plates. Types of engines exhibited.

Isotta-Fraschini Type V-6. Isotta-Fraschini Type V-6 Engine. Aviation, vol. 8, no. 5, Apr. 1, 1920, pp. 203-204, 1 fig. Four-stroke, vertical, six-cylinder, water-cooled engine rated at 250 hp. developed about 260 hp. at normal speed of 1650 r.p.m. Fuel consumption, 215 g. per hp.-hr.; oil consumption, 3 kg. per hr.

The Italian 6-Cylinder 160-Hp. Isotta-Fraschini Aeroplane Engine (Der italienische 6-Zylinder 160 PS Isotta-Fraschini-Flugmotor), Alfred Staribacher. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 10, nos. 17, 18, 19, 21, 22, 23-24, Sept. 27, Oct. 15, Nov. 15, 29 and Dec. 27, 1919, and vol. 11, nos. 1 and 3, Jan. 15 and Feb. 14, 1920, pp. 189-193, 204-208, 234-236, 255-261, 270-271, 6-7 and 40-42, 56 figs. Detailed description of engine and its parts, with specifications.

Liberty. Effects of Water Outlet Temperature on Engine Output. Automotive Industries, vol. 42, no. 18, April 29, 1920, pp. 1002-1003 and p. 1008, 5 figs. Tests made with Liberty engine to determine optimum water temperature are said to have established that best water outlet temperature is 170 deg. fahr. Tests were

made at McCook Field by Air Service Engineering Division.

Finishing Liberty Motor Connecting-Rods, H. A. Carhart. Am. Mach., vol. 52, no. 9, Feb. 26, 1920, pp. 457-460, 13 figs. Describes and illustrates different operations from sawing off caps to final inspection.

How Ford Built Liberty Motors, Fred H. Colvin. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1037-1041, 24 figs. Picture story of some fixtures used in assembling Liberty motors at Ford plant. It is maintained that many of assembling operations shown can be easily adapted to other work.

Jigs, Fixtures and Aeroplanes, A. D. Wilt, Jr. Aerial Age, vol. 10, no. 17, Feb. 9, 1920, pp. 627-628, 2 figs. Exemplifies extent of special machinery needed in construction of aeroplanes by itemizing special requirements of Ford Motor Co. in connection with their building of 5000 Liberty motors.

Liberty Motor Connecting-Rods, H. A. Carhart. Am. Mach., vol. 52, no. 22, May 27, 1920, pp. 1148-1152, 24 figs. Jigs and fixtures used.

Machining Bearings for Liberty Motors, Fred H. Colvin. Am. Mach., vol. 51, no. 14, Oct. 2, 1919, pp. 655-660, 20 figs. Description of connecting-rod crankshaft bearing which is said to involve many manufacturing problems, such as changing radius so as to allow half-bearings to be made from same cylinder, etc.

Machining the Liberty Crankcase, H. A. Carhart. Am. Mach., vol. 52, no. 24, June 10, 1920, pp. 1247-1252, 15 figs. Jigs and fixtures used with data as to cost of hand labor.

Standard Engine Report of 12-Cylinder Liberty Engine. Technical Orders no. 9, Oct. 1919, pp. 13-37, 18 figs. Information regarding design and performance of Army type Liberty engine.

The Increase of Power Output with Higher Compression Ratios. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1158-1159, 4 figs. Results of tests at McCook Field. Three sets of pistons were utilized in standard Liberty engine and characteristics were determined of high, medium and low compression ratio. Fuel consumption decreased as compression ratio was enlarged.

See also Types; LIBERTY MOTORS, Assembling.

Lorraine-Dietrich Experimental Work. The Lorraine-Dietrich Production of Airplane Engines, W. F. Bradley. Automotive Industries, vol. 42, no. 7, Feb. 12, 1920, pp. 449-453, 10 figs. Account of experimental work carried out in Lorraine-Dietrich factory during war is included.

Lubricating Oil for. Liberty Aero Oil, William F. Parish. Jl. Am. Soc., Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 45-98, 30 figs. Specifications for mineral lubricating oil for use on aircraft engines of stationary cylinder type, prepared by Oil and Lubrication Branch, Air Service, U. S. Army, in coöperation with various oil manufacturers. Oil is required to be a pure, highly refined petroleum product with viscosity at 212 deg. fahr. on Saybolt universal viscosimeter from 85 to 90 sec. for low-specific-gravity oils and from 70 to 75 sec. for high-specific-gravity oils. Flash point, pour test and carbon residue are also specified.

Magnetos. See MAGNETOS, Aircraft.

Marine Service. Aircraft Engines and High-Speed Marine Service, H. Massac Buist. Flight, vol. 12, no. 34, Aug. 19, 1920, pp. 908-909. British international motor-boat trophy lessons.

Maybach. Details of 300-Horsepower Maybach Airplane Engine. Automotive Manufacturer, vol. 61, nos. 6 and 7, Sept. and Oct. 1919, pp. 21-24 and 23-25, 7 figs. Mechanical construction and design features; carburetion and fuel supply system and fuel pump. Table of general data.

The 260 Hp. Maybach Aero and Dirigible Engine (Der 260 PS Maybach-Flug-und Luftschiffmotor), Otto Schwager. Motorwagen, vol. 23, nos. 6, 7, 10 and 11, Feb. 29, Mar. 10, Apr. 10 and 20, 1920, pp. 107-112, 130-137, 26 figs. 13 on supp. plate, 149-159, 26 figs. 9 on supp. plate, and 176-179, 4 figs. Account of development of Maybach engine. Detailed specifications are given in tabular form of 260-hp. type MbIVa, a six-cylinder stationary motor with 180 mm. stroke and 165 mm. bore, 1400 r.p.m.; weight, empty, 400 kg. Details of valves and valve springs, steering gear, carburetor and gas supply pipe, fuel feed, lubricating system and oil pumps, ignition, starting arrangement, drive of wireless telegraphy alternating current motor, etc. Details and constructions of firm's newest construction types, the MbIVa for aeroplanes and the MbIVaL for dirigibles. Curves are given showing results of tests of engines and of under-pressure chamber of Zeppelin.

Modern Types. Modern Aviation Engines, K. H. Condit. Am. Mach., vol. 53, no. 1, July 1, 1920, pp. 20-22, 4 figs. Motors used by British and by German forces.

Muffling. Investigations of the Muffling Problem for Airplane Engines. Nat. Advisory Committee for Aeronautics, report no. 55, 1920, 38 pp., 26 figs. Experiments with various types of muffling devices are recorded and a theory of muffling and associated problems is developed from results of experimental work.

Napier. Aircraft Practice in the 1920 Napier, M. W. Bourdon. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1056-1060, 9 figs. Overhead valves are fitted in detachable aluminum cylinder head and are operated by overhead camshaft; cylinder jackets and upper half of crank case are cased as unit in aluminum with pressed in steel liners for pistons.

See also British; Napier Lion.

Napier Lion. Aero Engine with New Arrangement of Cylinders, M. W. Bourdon. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1006-1012 and 1015, 13 figs. Napier Lion 450-hp., 12-cylinder engine designed and built for British air service. Attention is called to short stroke, roller-bearing crankshaft and special details of cylinder and head construction.

The 450-hp. Napier-Lion Engine. Aviation, vol. 8, no. 2, Feb. 15, 1920, pp. 65-66, 3 figs. Latest model is fitted with separate water-jacket for each cylinder instead of multiple jacket for each block of four cylinders. It is said that weight is saved in this manner.

New Type. New Airplane Engine Designed for Commercial Work. Automotive Industries, vol. 43, no. 5, July 29, 1920, pp. 204-205, 3 figs. Six-cylinder vertical type in which elimination of small parts and accessibility are said to be special features.

Olympia Show. The Aero Show at Olympia. Autocar, vol. 45, no. 1291, July 17, 1920, pp. 97-100, 11 figs. Notes on interesting features of aero engines exhibited.

Packard. Packard Aero Engine Type 2025. Aerial Age, vol. 11, no. 18, July 12, 1920, pp. 612-615, 5 figs. 12-cylinder type, with cylinders of 5¾ in. bore and 6½ in. stroke. Weight, 1118 lb.; lubrication, full-pressure feed type operating with dry sump; ignition, improved Delco type. Sustained speed of about 200 mi. per hr. believed to be possible.

The Packard 500-600 hp. Aircraft Engine.

Aviation, vol. 8, no. 12, July 15, 1920, pp. 470-472, 5 figs. Twelve-cylinder engine, weighing 1.94 lb. per hp., and with water, piping and radiator 2,275 per hp., claimed to be lightest in proportion to its power of any standard engine. Actual weight with propeller hub, carburetor, generator and ignition equipment is 1118 lb.

Paris Show. New Aircraft Engines at the Paris Aero Show. Aviation, vol. 8, no. 2, Feb. 15, 1920, pp. 54-56, 10 figs. General description of Clerget-Blin, Clement-Bayard, Salmson, Potez, Peugeot, Anzani, Sega, Panhard-Levassor and Lorraine-Dietrich, some of which have not as yet been tested in flight.

The Aeronautical Salon (Salon Aéronautique), Jean-Abel Lefranc. Nature (Paris), no. 2396, Apr. 3, 1920, pp. 133-138, 12 figs. Aeroplane engines exhibited at Paris aeronautical show. Comparative schemes of engines with 6, 12, 18 and 24 cylinders are shown.

The Paris Aero Show, 1919. Flight, vol. 12, nos. 6 and 7, Feb. 5 and 12, 1920, pp. 145-149, 11 figs., and 177-182, 15 figs. Notes on engines exhibited.

See also British; Design.

Performance. Flying an Airplane Engine on the Ground, S. W. Sparrow. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 239-244, 14 figs. Account of tests conducted at altitude chamber of dynamometer laboratory at Bureau of Standards. A set of standard comparative engine tests was selected for predicting value of engines for given service. These tests included (1) full-power runs at ground altitude over speeds ranging from 1200 to 2200 r.p.m., (2) full-power runs at two speeds and at altitudes ranging from ground level to 25,000 ft., (3) propeller load runs at altitudes of 5000, 10,000 and 15,000 ft., and (4) friction-horsepower runs.

Preliminary Airplane Performance Calculations. Technical Orders no. 9, Oct. 1919, pp. 41-104, 28 figs. Performance curves obtained from standard types of aeroplanes not equipped with superchargers nor variable-pitch propellers.

Some Factors of Engine Performance, V. R. Gage. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 402-405 and (discussion) pp. 405-408, 6 figs. Based on tests being conducted at U. S. Bur. of Standards under direction of Power plants Committee of National Advisory Committee for Aeronautics.

Piston Alloy. See MAGNESIUM ALLOYS.

Piston Rings. Science in the Foundry, A. Harley. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 220, April 1920, pp. 265-269, 7 figs. Practical conditions of scientific organization in foundry are pointed out, particularly with regard to storage and transport of material and systematizing production. Manufacture of piston rings for aeroplane engines is also taken up, and in this connection specifications are suggested for metal for piston rings. Paper read before Instn. of British Foundrymen.

Power Maintenance Without Supercharging. The Power Recuperating Engine, George Funck. Automobile Engr., vol. 10, no. 137, April 1920, pp. 145-153, 18 figs. Theoretical study based on entropy characteristics of gasoline engines. Two classes of engines are proposed for maintaining power at high altitudes without supercharging—(1) those having cycle of operations such as to maintain a maximum pressure, and (2) those which maintain a constant compression temperature—taking into account for both the atmospheric temperature variation. Mechanical means are suggested for operating these cycles.

Power Variation with Altitude. Engine Power and Height, H. T. Tizard. Engineering, vol. 108, no. 2807, Oct. 17, 1919, pp. 527-528, 3 figs. Study in light of experimental data of various hypotheses which have been set forth concerning variation of engine power at various heights. Paper read before Eng. Section, British Assn. for Advancement of Science.

Extract of British Report on Variation of Engine Horsepower with Altitude. Technical Orders, no. 9, Oct. 1919, pp. 113-115, 3 figs. Report is based on data secured in actual flight with several types of engines, including both water and air-cooled types. Experiments indicated that for all engines available horsepower was very nearly function of first power of atmospheric pressure and not of density.

Maintaining Airplane Engine Power at Great Altitudes, V. E. Clark. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 245-249, 7 figs. Performances obtainable at different altitudes with various assumed ratios of actual engine power at altitude to total weight of airplane, are computed for DeHaviland-Four, which is taken as typical of present practice.

Power and Fuel Consumption of Aeroplane Engines at Different Altitudes. (Prüfung der Höhenleistung von Verbrennungsmotoren in der Unterdruckkammer), H. Wilcke. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 13, July 15, 1920, pp. 185-190, 13 figs. Results of vacuum-chamber tests of power and fuel consumption of standard and supercharged engines at different densities of air and altitudes. Notes on employment of a fan in front of carburetor; overload capacity of engines; influence of temperature and exhaust back-pressure on output. Curves showing relationship between engine capacity, temperature and pressure in front of carburetor.

The Variation of Horsepower with Altitude. Air Service Information Circular, vol. 1, no. 92, Aug. 30, 1920, 3 pp., 1 fig. Empirical-theoretical chart for production of aeroplane performance.

Variation of Horsepower with Altitude and Compression Ratio, H. C. Dickinson, W. S. James and G. V. Anderson. Aerial Age, vol. 11, no. 2, Mar. 22, 1920, pp. 54-57, 8 figs. It is concluded from tests that (1) total power of engine decreases rapidly with increase in altitude, being only 71 per cent of power on ground at 10,000 ft., 49 per cent at 20,000 ft., and 32.5 per cent at 30,000 ft. and (2) gain in power due to increase in compression does not bear constant relation to total power of engine at different altitudes, being greater at high than at low altitudes. Report 45 of National Advisory Committee for Aeronautics.

Power Variation with Temperature. Variation of Horsepower with Temperature, H. C. Dickinson, W. S. James and G. V. Anderson. Aerial Age, vol. 11, no. 5, Apr. 12, 1920, pp. 154-157, 11 figs. Results of experiments with two Hispano-Suiza engines and three different makes of carburetors. Correction factor has been determined which varies with engine and carburetor conditions, but is believed to be approximately correct for type of engine under consideration and for temperatures between —20 deg. and 50 deg. cent. Curves showing graphically value of correction factor are shown and charts for correcting both temperature and barometric pressure are given.

Preignition. Increase in Maximum Pressures Produced by Preignition, S. W. Sparrow. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 520-521, 1 fig. Indicator diagrams showing pressure attained in cylinder when preignition occurs, obtained in course of investigation of effect of compression ratio on altitude performance conducted for Nat. Advisory

AEROPLANE ENGINES

Committee for Aeronautics at Bur. of Standards.

Progress During War. The Aviation Motor (Le moteur d'aviation). Aérophile, vol. 27, nos. 23-24, Dec. 1-15, pp. 361-364, 17 figs. Progress during war is reviewed and future developments are visualized.

Puma. See Siddeley Puma.

Radial. Engines, New Design. Eng. Division Air Service, Dayton, O., Technical Orders No. 7, Apr. 1919, pp. 39-40. Comparison of 9- and 10-cylinder radial engine balance.

Radial Aeroplane Engines (Sternform-Motoren), Otto Schwager. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, nos. 9 and 10, May 15 and 31, 1920, pp. 123-124 and 139-145, 5 figs. Doubts concerning the lubrication of such engines are refuted and conclusions are drawn for engines with suspended cylinders. Suggestions for constructive developments and discussion of balancing of the masses and construction of connecting rods. Efficiency of radial engines is pointed out.

The Cosmos Radial Airplane Engine Designed in England, M. W. Bourdon. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1314-1319, 8 figs. Some details of the Cosmos Jupiter I (direct drive) engine are: No. of cylinders, 9; bore, 5¾ in.; stroke, 7½ in.; bore-stroke ratio, 1.305:1; compression ratio, 5:1; total piston area, 233.703 sq. in.; stroke vol. of engine, 1752.772 cu. in.; maximum piston speed, 2312 ft. per min.; max. torque, 1277.5 lb.-ft.; total weight, 700 lb.; fuel consumption, 0.557 lb. per normal b.h.p. hr.; oil consumption, 0.070 lb. per normal b.h.p. hr.

Radiators. Design Factors for Airplane Radiators, Samuel R. Parsons. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 437-442. Based on formulæ and data published in reports of National Advisory Committee for Aeronautics.

Effects of Nature of Cooling Surface on Radiator Performance, S. R. Parsons and R. V. Kleinschmidt. Nat. Advisory Committee for Aeronautics, report no. 87, 1920, 13 pp., 7 figs. Among results obtained were that heat transfer is practically unaffected by light coating of clean oil on smooth surface, that pressure gradient is practically independent of roughness of surface over considerable range, that head resistance of radiator may be somewhat increased by polishing surfaces, as well as flow of air through core of radiator. It is specially emphasized that cooling surfaces and radiators should be kept clean.

Effect of Altitude on Radiator Performance, W. S. James and S. R. Parsons. Nat. Advisory Committee for Aeronautics, report no. 62, 1920, 13 pp., 10 figs. Method for estimating performance on radiator under altitude conditions in terms of its performance on ground is developed from data on effect of temperature and density of air on dissipation of heat and absorption of power.

General Analysis of Airplane Radiator Problems. Nat. Advisory Committee for Aeronautics, report no. 59, 1920, 9 pp.; also in Aerial Age, vol. 10, no. 15, Jan. 26, 1920, pp. 566-567. Basis on which experimental work is conducted at Bureau of Standards is explained and technical terms are defined.

General Discussion of Test Methods for Radiators. Nat. Advisory Committee for Aeronautics, report no. 60, 1920, 24 pp., 16 figs. Apparatus involved and methods of taking observations and of computing results employed in connection with measurements of (1) core characteristics, (2) heat dissipated, (3) power needed to lift radiator and overcome head resistance, and (4) mass flow of air through core.

Investigations of Aeroplane Radiators at the Aircraft Arsenal in Vienna (Untersuchungen an Flugzeugkühlern beim Luftfahrarsenal in Wien), H. Praetorius. Motorwagen, vol. 23, nos. 7 and 10, Mar. 10 and Apr. 10, 1920, pp. 127-129 and 159-163, 2 figs. Slightly condensed abstract of report recently released by the Austrian Minister of War, dealing with heat transmission and cooling capacity, determination of the cooling surface, air resistance of radiator, etc. Details of the investigated coolers from the Daimler Motor Works, Weich & Co., and the Fiat Works Corp.

Preliminary Report on Resistance due to Nose Radiator. Flight, vol. 11, no. 47, Nov. 20, 1919, pp. 1509-1510, 8 figs. Based on experiments carried out by Am. Bur. of Standards.

Pressure Drop in Radiator Air Tubes, S. R. Parsons. Nat. Advisory Committee for Aeronautics, report no. 88, 1920, 11 pp., 10 figs. Steel tube 0.04 in. in outside diameter and 20 in. long with static pressure opening near center was stretched through air tube of radiator and used to measure static pressure in stream of air passing through radiator tube. It was concluded that drop in static pressure in air stream through cellular radiator and pressure gradient in air tubes are practically proportional to square of air flow for given air density.

Properties of Special Types of Radiators, S. R. Parsons. National Advisory Committee for Aeronautics. Report no. 86, 16 pp., 24 figs., 3 on supp. plates. Investigation conducted for National Advisory Committee for Aeronautics at Bureau of Standards.

Radiators and Cooling Systems for Aircraft Engines, R. N. Liptrot. Aeronautics, vol. 18, nos. 341 and 342, Apr. 29 and May 6, 1920, pp. 345-347, 1 fig., and 364-366, 1 fig. Apr. 29: Data on heat to be dissipated by radiator, obtained in experiments at various aeronautical laboratories, are quoted, and rules are formulated for designing radiators and cooling systems for aeroplane engines. May 6: Notes on design of water-tube and honeycomb radiators. Reference is made to experiences which are said to have demonstrated that yawing honeycomb radiator at angle with direction of flight increases its cooling effect. Papers read before Inst. of Aeronautical Engrs.

The Investigation of Aircraft Radiators at the Bureau of Standards, Samuel R. Parsons. Aerial Age, vol. 11, nos. 14 and 15, June 14, 21, 1920, pp. 476-478, 4 figs., and 511-513. June 14: Summary of experimental results obtained at laboratory of Bureau of Standards. June 21: Results of tests are given in connection with fastening of trailing edge, aeroplane and balloon fabric seams and reinforced balloon cloth.

Requirements. Aeroplane Motors in 1919 (Les moteurs d'aviation en 1919). L'Aéronautique, no. 7, Dec. 1919, pp. 261-272, 12 figs. Requirements of engines in aeroplane service are discussed theoretically and how these requirements are met in practice is illustrated by reference to various important types. Graph indicating comparative weights of principal French and British types is included.

Rolls-Royce. The Rolls-Royce Aircraft Engines Described and Illustrated. Automotive Industries, vol. 43, nos. 5, 6, 7 and 8, July 29, Aug. 5, 12 and 19, 1920, pp. 210-214, 18 figs., 261-265, 12 figs., 316-320, 11 figs., and 367-369, 6 figs. Detailed description of larger size of Eagle type Rolls-Royce engine: 12-cylinder "V" type, with bore of 114 and stroke of 165 mm., output 352 hp., and 1650 to 1800 r.p.m. Fuel-supply system and epicyclic reduction gear which is said to be very compact and has advantage of not changing po-

sition of propeller hub. Table appended gives calculated stresses in gears and other data. Translated from Der Motorwagen.

Rotary. Constructive Details of Rotary Aeroplane Engines (Konstruktive Einzelheiten an Umlaufmotoren), H. Praetorius. Motorwagen, vol. 23, no. 2, Jan. 20, 1920, pp. 21-24, 6 figs. Writer points out importance of development of connecting rods and gives descriptions and illustrations of various types of construction.

The Valve Gear of Rotary Aeroplane Engines (Die Steuerung der Umlaufmotoren), H. Praetorius. Motorwagen, vol. 22, nos. 33 and 34, Nov. 30 and Dec. 10, 1919, pp. 625-630 and 661-664, 20 figs. Details and illustrations of various designs and patents.

See also Siemens Rotary.

Salomon. The Salomon Motor in which Fuel Charge Varies with Altitude (Le moteur Salomon á remplissage variable), M. d'About. Vie Automobile, vol. 16, no. 703, April 10, 1920, pp. 131-134, 2 figs. Motor for flying at high altitudes. Entrance of charge into cylinder is regulated by automatic spring valve, placed between carburetor and valve, which opens only when difference of pressures on both of its sides is 0.3 kg. per sq. cm. At low altitudes, automatic value permits passage of only 0.6 of total charge. Ratio increases with increase in altitude.

Self-Starters. The Odier Self-Starter. Aeronautics, vol. 17, no. 313, Oct. 16, 1919, p. 370, 2 figs. For aeronautic engines.

Shape as Affecting Operation. Engine Shape as Affecting Airplane Operation, Grover C. Loening. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 417-421, 7 figs. Graphs are constructed with data published in technical press. Abscissæ are speeds in miles per hour, and ordinates total air resistance of engine due to its shape and its weight as carried by wing.

Siddeley Puma. The Siddeley Puma Aircraft Engine. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 369-376, 26 figs., partly on supp. plate. Engine has six cylinders in line and is of vertical water-cooled type. Valves are actuated by overhead camshaft which operates exhaust valves directly from cams and inlet valves by means of rockers. Cylinders are of aluminum, with steel liners ranged in special manner.

Siemens Rotary. The Siemens Rotary Aeroplane Engine (Der Siemens-Umlauffugmotor), Otto Schwager. Der Motorwagen, vol. 22, no. 29, Oct. 20, 1919, pp. 542-549, 33 figs., 20 on 2 supp. plates. Advantages are said to be good balancing of masses, high uniformity of running, easy manœuvring during flight, simple construction, and light weight; disadvantages: large amount of fuel and oil consumed, effect of centrifugal moment (caused by revolving masses) on steering efficiency, limitation of speed to 1200 r.p.m. Construction data are given.

Siemens-Schuckert. German Airplane Motors (Les moteurs d'aviation allemands), G. Crouvesier. Aérophile, vol. 27, nos. 17 and 18, Sept. 1-15, 1919, pp. 275-278, 6 figs. Siemens-Schuckert 160-hp., 11 cylinder rotary engine.

Sikh. See British.

Spark Plugs. See SPARK PLUGS.

Speed Indicators. Speed Indicator for Examining Propeller and Motor during Flight (Die Messnabe für Schrauben- und Motorprüfungen im Fluge), O. Enoch. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, no. 19, Oct. 15, 1919, pp. 208-215, 14 figs.

The Speed Indicator and Flywheel of a Motor (Die Messnabe und das Schwungrad des Motors), E. Everling. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 17 and 18, Sept. 27, 1919, pp. 181-182. Results of experiments at the German Aircraft Testing Station.

Starting. The Starting of Aeroplane Engines, T. L. Sherman. Automobile Engr., vol. 9, nos. 132 and 133, Nov. and Dec. 1919, pp. 366-368, 3 figs., and 416-419, 7 figs. Nov.: Classification of systems of starting and suggestions in regard to effecting improvements. Dec.: Clutch designed by writer, in which sliding members are plungers, case-hardened all over, ground to fine limits, and lapped into position to secure free movement with minimum amount of tipping.

Sunbeam-Coatalen. The 12-Cylinder 800/900 H.P. Sunbeam-Coatalen Aircraft Engine. Aerial Age, vol. 11, no. 7, April 26, 1920, p. 221, 2 figs. Dimensions: Bore of cylinders, 180 mm. (7.086 in.); stroke of cylinders, 210 mm. (8.268 in.); normal speed of propeller, 920 r.p.m.; weight of engine complete without fuel, water or oil, 1952 lb.

Supercharged. The Design of Supercharged and Over-Dimensioned Aircraft Motors. Aeronautics, vol. 19, no. 355, Aug. 5, 1920, pp. 118-119, 3 figs. Method of calculating dimensions of an over-dimensioned and supercharged motor. Translated from Technische Berichte.

Superchargers. General Electric Turbo Supercharger for Airplanes, Sanford A. Moss. Aviation, vol. 8, no. 4, Mar. 15, 1920, pp. 146-151, 11 figs. Principle of operation of turbo supercharger is explained and design developed by General Electric Company is described. Records of supercharger performances are included.

Superchargers for Airplane Engines, Sanford A. Moss. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 345-348. Treats of aeroplane-engine development showing value of supercharger for high altitude flying.

Supercharging Turbo-Compressors for Flying Machines (Flugzeuggebläse), W. G. Noack. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, nos. 41 and 42, Oct. 11 and 18, 1919, pp. 995-1002 and 1026-1032, 47 figs. Cause of and precautions to be taken against decrease of motor efficiency at high altitudes, drive and regulation of turbo-compressors; description of Brown, Boveri & Cie., Siemens-Schuckert, A. E. G. and Schwade equipments.

See also AEROPLANES, International Exhibition; Performance; IGNITION; SPARK GAPS.

Supercharging. Flight Aspects of Supercharging, B. Thompson. Flight, vol. 11, no. 49, Dec. 4, 1919, pp. 1555-1558, 3 figs. Comparative efficiency performance curves both normal and with supercharge, and considerations on propeller design in relation to supercharging.

Flight at Very High Altitudes and the Use of Turbo-Compressors (Quelques considerations sur les vols aux très grandes altitudes et sur l'emploi du turbo-compresseur), M. A. Rateau. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 13, March 29, 1920, pp. 782-788. Value of supercharging for reaching high altitudes is concluded from recent records attained with engines fitted with turbo-compressors. Reference is particularly made to ascent to 36,020 ft. by R. W. Schroeder of U. S. Air Service.

Internal-Combustion Motors for Rarefied Atmospheres (Les moteurs à explosions pour atmosphères rarefiées), Jean Villey. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 3, Jan. 19, 1920, pp. 171-174. Comparative value of super-compression, variable compression, supercharging and other processes.

Superchargers and Supercharging Engines, George E. A. Hallett. Jl. Soc. Automotive

Engrs., vol. 5, no. 5, Nov. 1919, pp. 371-375, 5 figs. Outlines past developments in supercharging and points out lines of attack which seem to be meeting with most success. States that at 25,000 ft. altitude a supercharged 250-hp. engine will deliver as much power as a 1000-hp. engine without a supercharger, and will weigh many hundred pounds less, first cost will be lower and structure of airplane can be made much lighter.

The Supercharging of Internal-Combustion Engines, Georges Funck. Automobile Engr., vol. 9, nos. 132 and 133, Nov. and Dec. 1919, pp. 377-380, 9 figs., and 421-423, 6 figs. Nov.: Methods of supercharging. Dec.: Effect of supercharging is illustrated with altitude diagrams, taken both with and without supercharging.

The Value of Supercharging. Flight, vol. 12, no. 3, Jan. 15, 1920, pp. 83-85, 5 figs. Based upon test made at Altitude Laboratory of Bur. of Standards to determine effect produced upon horsepower output of aeroplane engine by introduction of air to carburetor at higher pressure than exhaust or back pressure.

The Value of Supercharging. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 65-67, 5 figs. Results of tests undertaken at Bureau of Standards.

Test Engine, Universal. Universal Test Engine. Air Service Information Circular, vol. 1, no. 47, May 8, 1920, 7 pp. In this engine, it is said, cylinders can be tested which have bore diameters from 4 to 8 in. inclusive, and strokes from 4 to 8 in., inclusive.

Universal Test Engine, Glenn D. Angle. Aviation, vol. 8, no. 6, April 15, 1920, pp. 230-234, 9 figs. Developed at Governmental Experimental Airplane Station at McCook Field, Dayton, Ohio. Cylinders can be tested which have bore diameters 4 to 8 in., inclusive, and strokes from 4 to 10 in., inclusive.

Testing. Engine Power and Height, H. T. Tizard. Engineering, vol. 108, no. 2808, Oct. 1919, pp. 561-563, 5 figs. Examination of performance tests of airplanes and bench tests made under artificial altitude conditions in order to determine whether or not density of charge entering cylinder is proportional to density of external atmosphere. It is concluded that "no good case can be made out at the present time for abandoning the standard method of reducing performances in favor of one which assumes that engine power is independent of atmospheric temperature." Paper read before Eng. Section of British Assn. for Advancement of Sci.

Tests. A Study of Airplane Engine Tests, Victor R. Gage. Nat. Advisory Committee for Aeronautics, no. 46, 1920, 39 pp., 33 figs. Results obtained from tests on Hispano-Suiza aeroplane engine in altitude laboratory of Bur. of Standards. Among results found are: Indicated horsepower decreases in direct proportion to decreased density of air; brake thermal efficiency remains constant at about 24 per cent on ground at all speeds; heat lost in exhaust is at maximum at 1900 r.p.m. at all altitudes, and amounts to almost 50 per cent of heat supplied on ground, decreasing to about 40 per cent at 30,000 ft. altitude; heat lost through friction varies from 2 per cent at 1700 r.p.m. and 3 per cent at 2100 r.p.m. on ground to 6 and 8 per cent, respectively, at 30,000 ft. altitude; and heat loss in jacket water is about 17 per cent of that supplied at all speeds on ground, increasing to 28 per cent at 2100 r.p.m. and 35 per cent at 1300 r.p.m. at 30,000 ft.

Tests on Liberty, Benz and Mercedes Engine Manifolds. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1204-1207, 12 figs. Difference in fuel consumption found in using various engine manifolds, power output remaining practically the same in each case. Tests conducted at McCook Field.

The Altitude Laboratory for the Testing of Aircraft Engines, H. C. Dickinson and H. G. Boutell. Flight, vol. 11, no. 43, Oct. 23, 1919, pp. 1398-1404, 9 figs. Air cooling systems; jacket circulating-water cooling system; exhaust system; measurement of air flow to carburetor; temperature measurements.

See also High-Altitude; Liberty; CARBURETORS.

Thomas-Morse MB-4. The Thomas-Morse MB-4 Mail Plane. Aviation, vol. 8, no. 3, Mar. 1, 1920, pp. 99-100, 2 figs. Specifications: Length, 25 ft. 5 in.; spread, 45½ ft.; height, 11 ft.; high speed, 12 m.p.h.; low speed, 53 m.p.h.; total weight, 5564 lb.; power plant, Hispano-Suiza model H; rated hp., 300; fuel capacity, 140 gal.; oil capacity, 10 gal.; propeller, two 2-blade tractors.

Torque Measurement. See AUTOMOBILE ENGINES, Torque Measurement.

Turbo-Compressors for. The Problem of the Turbo-Compressor, René Devillers. Aerial Age, vol. 12, nos. 4 and 5, Oct. 4 and 11, 1920, pp. 107-108 and 139-141. Oct. 4: Tests to determine influence of back pressure at exhaust on power. Analytical determination of compression stress of air admitted to carburetor. Oct. 11: Calculations of required efficiency of turbo-compressor set. Translated from French by Paris office, Nat. Advisory Committee for Aeronautics.

Types. Modern Aviation Engines, K. H. Condit. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 396-398, 4 figs. Brief sketches of Liberty, Hall-Scott, Curtiss and Hispano-Suiza engines.

Valve Gear. See Fiat; Rotary.

Valves. The Advantages of the Multiple Valve-Arrangement (Die Vorteile der Mehrventilanordnung), Friedrich Soltau. Wirtschafts-Motor (formerly Oelmotor), no. 1, Jan. 1920, pp. 23-25, 3 figs. Gives table showing results of experiments carried out by the Am. Nat. Advisory Committee for Aeronautics at the Clarke Thomson Research experimental station, in connection with which writer seeks to demonstrate that the value and sequence of discharge coefficients are not in contradiction to the general assumption of the losses of flow, but can be calculated in a simple manner so as to agree with results of experiments.

Vibration. Vibration of Differential Engines, J. Morris. Aeronautics, vol. 17, no. 314, Oct. 23, 1919, pp. 392-393. Vibration is studied by methods of dynamics, engine being considered as case of overhanging revolving tail shaft with load on it revolving in opposite direction.

Viking. The Viking Aircraft Motor. Aerial Age, vol. 10, no. 9, Dec. 8 and 15, 1919, p. 325, 1 fig. Sixteen-cylinder, air-cooled, X type, having four rows of cylinders of four cylinders each, set at 90 deg. angle.

Zeitlin. See also Clerget.

[See also INTERNAL-COMBUSTION ENGINES.]

AEROPLANE PROPELLERS

Air-Screw Theory. A Fundamental Theorem in Airscrew Theory, A. R. Low. Aeronautics, vol. 18, no. 348, June 17, 1920, pp. 466-467, 5 figs. It is demonstrated that characteristic curve of thrust of any airscrew against singular speed for given forward speed can be transformed into corresponding curve at any other given speed.

Aluminum Leaf Covering. Efficiency of Aluminum Leaf on Airplane Propellers, A. C. Knauss. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 124-

125, 3 figs. Tests conducted at Forest Products Laboratory, Madison, Wis. It is concluded that aluminum leaf-covering is "in all respects as good and in most respects much better than spar varnish."

Bakelite Micarta. Bakelite Micarta Propellers. Aviation, vol. 8, no. 9, June 1, 1920, pp. 354-357, 4 figs. Method of manufacture and graph of flight tests of wooden and micarta propellers.

Bakelite-Micarta Airplane Propellers, N. S. Clay. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 482-484, 7 figs. Characteristics of bakelite-micarta said to make this material particularly suitable for propeller construction. Method of manufacturing propellers of bakelite-micarta is outlined.

Balancing. The Difficulties Encountered in Balancing Propellers Made of Quarter Sawn Material, E. F. Horn. Aerial Age, vol. 10, no. 16, Feb. 2, 1920, pp. 601-602, 1 fig. Also Eng. Division Air Service, Dayton, O., Technical Orders no. 7, Apr. 1919, pp. 78-82, 1 fig. Data compiled at Forest Products Laboratory, U. S. Forest Service, are presented which show that density of wood on either side of hub when laminations are cut from quarter-sawn lumber of red or white oak varies widely between individual boards, variations of greater number of laminations being 0.1 and 0.2.

Curves. Air Propellers (Verstellbare Luftschrauben), C. Eberhardt. Motorwagen, vol. 22, no. 19, July 10, 1919, pp. 333-338, 7 figs. Properties of curves.

Design. Approximating Bending Moments in Air Propellers, Edward P. Warner. Aviation, vol. 8, no. 11, July 1, 1920, pp. 430-431, 2 figs. Describes method which, it is claimed, has been found to give results of quite surprising accuracy. In order to permit analytical determination of bending moments, load-grading curve was assumed to be made up of three straight lines and parabola.

Notes on Propeller Theory and Design, Alexander Klemin. Aviation, vol. 8, no. 10, June 15, 1920, pp. 396-401, 15 figs. Based on theoretical assumptions and examinations of results of tests of various experimenters, notably Durand's tests at Leland Stanford Laboratories.

Physical Basis of Air-Propeller Design, F. W. Caldwell and E. N. Fales. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 213-219 and 260-261, 13 figs. Description of wind tunnel at McCook Field, Dayton, Ohio. Velocity of air used is 500 m.p.h. and air flow is visualized by maintaining humidity of air in tunnel at predetermined level and providing opportunities for its condensation where it will show character of air flow.

Screw Propellers, M. A. S. Riach. Aeronautics, vol. 19, nos. 359-363, Sept. 2, 9, 16, 23 and 30, 1920, pp. 179-181, 1 fig., 199-201, 213, 227-229 and 241-242, 4 figs. Sept. 2: Formulæ for axial-thrust blade element. Sept. 9: "Wash" and "inflow" theories of propeller and their relation to each other. Sept. 16: Formulæ. Sept. 23: Notes on use of coefficient "K." Sept. 30: Method of designing.

Dynamometer Hub. The Aircraft Dynamometer Hub. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 260-262, 10 figs. Device is fitted on extension of crankshaft instead of usual propeller hub, and carries propeller in such a way that propeller is in same position as with usual method of fitting. Dynamometer hub consists of gages with automatic regulations fitted between two main parts of device, moving independently one of the other; one of these is connected to crankshaft and the other is connected solid to propeller. Extract from 18th Report of "Deutschen Versuchsanstalt für Luftfahrt" issued in Technical Memorandum No. 19 by Controller of Information, Department of Controller-General of Civil Aviation, Air Ministry.

German Design. German Propeller Has Steel Core Rods with Wood Fillings. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 900-901, 3 figs. New construction, worked out by a German engineer, is said to have withstood rigid service tests for two years without change of profile or other deterioration. Design is said to be especially suitable for use in tropical regions.

Indirect Drives. Indirect Propeller Drives. Aeronautics, vol. 18, no. 344, May 20, 1920, p. 406. Advantages and disadvantages. From notes published by Air Ministry.

Laminations for. Density Classification of Laminations for Aeroplane Propellers, E. F. Horn. Aerial Age, vol. 10, no. 13, Jan. 12, 1920, p. 502, 2 figs. Results of work at Forest Products Laboratory of U. S. Forest Service, Madison, Wis., in coöperation with U. S. War and Navy Depts. are said to have shown that at same moisture control density classifications can be made according to weight.

Moisture Absorption During Gluing. The Absorption of Moisture by Propellers During Gluing. Eng. Division Air Service, Dayton, O., Technical Orders no. 7, Apr. 1919, pp. 73-78, 1 fig. Results of tests are said to have shown that during gluing process, laminæ received moisture (1) internally from glue mixture retained in joints, and (2) externally, from excess glue on propeller block and from atmosphere of room. Amount of moisture absorbed was found to depend on species, variation in moisture content at gluing, glue-room conditions and on thickness of laminæ.

Pitch and Climbing Capacity. The Aeroplane in Diagram (Das Flugzeug in Diagramm), H. Schuster. Luftfahrt, vol. 24, nos. 3 and 4, Mar. and Apr. 1920, pp. 41-43 and 60-61, 2 figs. Points out influence of propeller pitch on climbing capacity of aeroplane. Shows by diagram that propeller with large pitch is favorable for speed, and one with small pitch for climbing capacity of machine, and that choice of pitch must be made accordingly.

Research. Experimental Research on Air Propellers—II. Nat. Advisory Committee for Aeronautics, no. 30, 1919, 65 pp., 42 figs. Investigation covered (1) tests under conditions of flight on 16 model propellers of different forms, sections or pitch ratios, (2) tests under conditions of flight on one model propeller of variable pitch, (3) tests under conditions of flight on three sets of right and left hand model propellers in series, (4) tests on 12 model propellers to determine brake effect or negative thrust at negative slip and (5) standing thrust and power tests of 67 model propellers.

Tandem. Note on the Efficiency of Tandem Propellers, J. G. Coffin. Aviation, vol. 7, no. 8, Nov. 15, 1919, p. 350. Formula showing that it is always detrimental to run propeller in slip stream of another unless other attendant gains more than compensate for necessary loss in efficiency thereby incurred.

Tandem Propellers (Hélices en tandem), G. Eiffel. Aérophile, vol. 27, nos. 21-22, Nov. 1-15, 1919, pp. 322-334, 13 figs. Tests to determine to what extent power of rear propeller is affected by motion of fore unit. Three series of experiments were conducted: On two propellers of equal diameter rotating with same speed in same direction; on two propellers of equal diameter rotating at different speeds in opposite directions; and on two propellers of different diameters rotating with same speed in opposite directions. Best tandem arrangement found was forward propeller of unity pitch and rear propeller of equal or similar diameter, propellers rotating in opposite directions.

Testing. The Propeller Testing Laboratory of the Army Air Service at McCook Field. F. W. Caldwell. Aerial Age, vol. 10, no. 10, Dec. 22, 1919, pp. 365-370, 15 figs. Description of laboratory equipment and outline of tests that are carried out.

Testing Stations. The Air Propeller Testing Station in Fischamend near Vienna (Die Luftschrauben-Prüfanstalt in Fischamend bei Wien), R. Katzmayr. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 13, July 15, 1920, pp. 192-194, 4 figs. Most important part of plant is said to be the wind tunnel with maximum length of 28 m. constructed entirely of wood and provided with four sizes of inlet nozzles ranging from 3000 to 4000 mm. diam.

Tests. Experimental Research on Air Propellers, III, W. F. Durand and E. P. Lesley. Nat. Advisory Committee for Aeronautics, no. 64, 1920, 35 pp., 44 figs. Influence of following characteristics was examined: (1) nominal pitch ratio 1.3 combined with certain number of more common forms and proportions; (2) driving face slightly rounded or convex; (3) change in location of maximum thickness ordinate of blade section; and (4) pushing forward leading edge of blade, thus giving rounded convex surface on leading side of driving face.

Theory. A Complete Theory of the Screw Propeller Working in Air, M. A. S. Riach. Engr., vol. 108, nos. 2803, 2810 and 2816, Sept. 29, Nov. 7, and Dec. 19, 1919, pp. 361-363, 601-603, 3 figs., and 809-812, 6 figs. Sept. 29 and Nov. 7: Example of application of method for designing air screw outlined in preceding installments, which takes into account both slip and inflow velocity and rotation set up in race column. Dec. 19: Illustrates application in design work of charts constructed from slip-angle formula.

An Expansion of the Propeller Race Theory (Eine Erweiterung der Schraubenstrahl-Theorie), A. Betz. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, nos. 7-8, Apr. 30, 1920, pp. 105-109, 7 figs. If the distribution of the thrust over the propeller circle area is not limited—that is, if any number of propeller blades are permissible—a favorable distribution of thrust is obtained under simultaneous consideration of the axial and the tangential velocities in propeller race.

Introduction to Propeller Theory, Alexander Klemin. Aviation, vol. 8, no. 4, Mar. 15, 1920, pp. 152-154, 4 figs. Exposition of Drzewiecki propeller theory and of Rankine-Froude momentum theory, with notes on application of Bernoulli's theorem to airscrew.

New Theory of the Screw Propeller, M. A. S. Riach. Aeronautics, vol. 19, no. 354, July 29, 1920, pp. 98-100, 1 fig. Theory refers to "static" case of V-O.

Screw Propellers, M. A. S. Riach. Aeronautics, vol. 19, no. 358, Aug. 26, 1920, pp. 161-163. Theory of action of screw propellers.

See also Design; AEROPLANES, Design.

Thrust. Thrust and Power of Rotating Blades that are Unevenly Twisted (Poussées et puissances de pales tournantes inégalement tordues), M. Amans. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 18, Nov. 3, 1919, pp. 779-781. Table giving experimentally measured thrust for various incidences of blade to equator plane.

Thrustmeter. Recording Propeller Thrustmeter. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 675-677, 6 figs. Device designed by Airplane Engineering Division of U.S.A. It consists of separate driving mechanism and propeller mounting so arranged that propeller may slide longitudinally to limited extent on its shaft, while still being turned through positive connection with engine.

Variable-Pitch. Variable Pitch Propellers (Verstellbare Luft schrauben), C. Eberhardt. Motorwagen, vol. 22, no. 21, July 31, 1919, pp. 365-368, 6 figs. Adaptation of propellers to height of flight.

Vibration of Shaft. The Vibrating, Whipping and Whirling of an Airscrew Shaft, J. Morris. Aeronautics, vol. 18, no. 328, Jan. 29, 1920, pp. 108-110, 3 figs. Theoretical study of nature and amount of vibration likely to be encountered by disturbed motion of airscrew shaft. Several objections are alleged against steady-motion treatment.

Wind Tunnels. See WIND TUNNELS.

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Aerofoils. An Introduction to the Study of the Laws of Air Resistance of Aerofoils. Nat. Advisory Committee for Aeronautics, report no. 28, 1920, 75 pp., 59 figs. Apparent flow deflection produced by aerofoil is examined, as well as intensity and direction of tip vortices. Possibility of formation of two waves behind an aerofoil is studied, and numerical values of the order of their magnitude are included. Discussion of Kutta theorem, generalization of Bernouilli theorem, and equations of metacentric curves are appended.

Report of Wind Tunnel Test on U. S. A. Aerofoils 25, 26, 27, 28, 29. Air Service Information Circular, vol. 1, no. 49, May 12, 1920, 19 pp., 15 figs. Tables and charts are included which give ordinates K_y, K_x, L/D and center of pressure travel of each section.

The Aerodynamic Properties of Thick Aerofoils Suitable for Internal Bracing, F. H. Norton. Flight, vol. 12, nos. 18 and 19, Apr. 29 and May 6, 1920, pp. 480-483, 14 figs., and 499-501, 3 figs. Apr. 29: Effect of adding convex lower surface to thick tapered wing. May 6: Graphs showing mean thickness of wing against Lc, Dc and L/D for various angles of incidence and against L/D for various values of Lc.

The Aerodynamic Properties of Thick Aerofoils Suitable for Internal Bracing. Nat. Advisory Committee for Aeronautics, report no. 75, 1920, 26 pp., 29 figs. Results of experiments made to determine (1) effect of changing upper and lower camber of thick aerofoils of uniform section, (2) effect of thickening center and thinning tips of thin aerofoil, (3) effect of adding convex lower surface to tapered section, (4) effect of changing mean thickness with constant center and tip sections, and (5) effect of varying chord along span.

The Correction of Aerofoil Characteristics for Scale Effect, Alexander Thom. Flight, vol. 12, no. 40, Sept. 30, 1920, pp. 1042-1043, 4 figs. Correction curves which are constructed from results of experiments dealing with speed-scale effect.

Two New Clark Aerofoils. Aviation, vol. 8, no. 10, June 15, 1920, pp. 394-395, 5 figs. Comparison of U. S. A. 26 and U. S. A. 27 aerofoils developed by Maj. V. E. Clark of Eng. Division, United States Air Service.

Aerophysical Investigations. Aerophysical Investigations with an Aeroplane (Aerophysikalische Forschungen mit dem Flugzeuge), Albert Wigand. Luftfahrt, nos. 1-2, Jan. 1920, pp. 8-10, 6 figs. Results of tests are said to show that for recording of atmospheric-electrical charges, conditions in aeroplane are in some respects very favorable if the instruments employed are insensitive to shocks, and the Wulf double-filament electrometer is said to be well adapted thereto. For measurement of the ionization, a tube condenser with anemometer is used; for recording total energy of radiation

of the sun during climb, a thermometric method, similar to the Michelson-Marten method, is recommended.

Air Brakes. Air Brakes for Aeroplanes, R. Rolleston West. Engineer, vol. 128, no. 3336, Dec. 5, 1919, pp. 570-572, 7 figs. Problems and difficulties involved in design and fitting of air brakes are discussed. Comparative table of air brakes is presented. Paper read before British Assn. for Advancement of Science.

Air-Service Types. Airplanes—Applied Design. Eng. Division Air Service, Dayton, O., Technical Orders nos. 7 and 8, Apr. 1919, Sept. 1919, pp. 9-13, 12 figs., and 9-24, 17 figs. Apr. 1919: Report of machines which are either in service or regarded as having passed experimental stage and are either in production or being considered for production. Sept. 1919: Classified list of types of airplanes required by air service.

Alerion. See Lacoin-Damblanc.

All-Metal. Experiences in the Construction of Metal Aeroplanes (Eigene Arbeiten auf dem Gebiete Metall-Flugzeugbaues), H. Junkers. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 3, Feb. 14, 1920, pp. 35-37, 7 figs. Writer explains why metal was employed for construction of the Junkers aeroplanes and gives reasons why it is perhaps advisable to employ metal in place of wood.

See also Boulton & Paul; Junker.

Altitude Testing. Altitude Laboratory for the Testing of Aero Engines, H. C. Dickinson and H. G. Boutell. Aerial Age, vol. 10, no. 4, Oct. 6, 1919, pp. 122-123 and 134, 3 figs. Description of laboratory constructed at Bur. of Standards for National Advisory Committee for Aeronautics.

Amphibian. Navy Specifications for Two-Place Amphibian Planes. Aviation, vol. 8, no. 9, June 1, 1920, p. 362. Specifications issued by Bureaus of Construction and Repair and of Steam Engineering, Navy Department, for aeroplanes capable of being used either as seaplanes or as land planes.

Navy Specifications for an Amphibian Plane. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 437-438. Machine is required to operate as seaplane and as land plane. Specifications are quoted for bids.

Ansaldo Transport. New Ansaldo Transport Airplane. Aviation, vol. 9, no. 5, Oct. 1, 1920, p. 165, 1 fig. Machine is tractor biplane equipped with Fiat A 12-bis 300 hp. engine. Speed is 112 m.p.h.; weight with fuel is 2535 lb. and permissible load is 1653 lb.

Anzani. See Paris Show.

Armored. See Junker.

Armstrong-Whitworth. The Armstrong-Whitworth Aeroplanes. Aerial Age, vol. 10, no. 6, Oct. 27 and Nov. 3, 1919, pp. 203-204, 3 figs. Principal characteristic of 90-hp. biplane type F. K. 3, 160-hp. biplane type, F. K. 8, A. W. quadruplane type F. K. 10, A. W. Armadillo, and A. W. Ara single seater.

Artillery Fire Observation. Aeroplane Observation of Artillery Fire Against Ships, R. H. Hazeltine. Jl. U. S. Artillery, vol. 52, no. 1, Jan. 1920, pp. 55-65, 7 figs. Method of determining relative position of target and splash.

Assembling. Some Details of Airplane Manufacture, Fred H. Colvin. Am. Mech., vol. 52, no. 4, Jan. 22, 1920, pp. 201-204, 17 figs. Assembling methods in use at plant of Glenn Martin Co.

Austrian W. K. F. The Austrian W. K. F. Sporting Biplane. Flight, vol. 12, no. 34, Aug. 19, 1920, pp. 901-903, 7 figs. Dimensions: Span, 17 ft. 3 in.; chord, 3 ft. 3 in.; overall length, 14 ft. 4½ in.; overall height, 7 ft.; area of main plains, 101 sq. ft.; weight, fully loaded, 740 lb.; speed, maximum, 81 m.p.h.

Aviatik. The Airplane and Automobile in Germany To-day, W. F. Bradley. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 893-895, 3 figs. Details and illustrations of new 22-passenger airplane, called the Aviatik, which is said to be largest machine of German construction, of which writer claims only incomplete details have been received in America.

Avro Triplane. A New Avro Triplane. Flight, vol. 12, no. 10, Mar. 4, 1920, pp. 258-259, 4 figs. Specifications: Span, 37 ft. 3 in.; overall length, 29 ft. 10 in.; overall height, 14 ft. 5 in.; weight fully loaded, 3000 lb.; speed range, 45-94 m.p.h.

Avro Triplane Type 547. Aerial Age, vol. 11, no. 5, Apr. 12, 1920, pp. 152-153, 5 figs. Specifications: Overall length, 29 ft. 10 in.; overall height, 14 ft. 4 in.; weight loaded, 3000 lb.; max. speed, 94 m.p.h.; engine, 160 hp. Beardmore 6-cylinder.

Balancing. Balancing of Airplanes (Centrage des Avions), L. Huguet. Vie Technique & Industrielle, vol. 1, no. 3, May 1920, pp. 118-122, 9 figs. Technical study of relative influence of various elements of an aeroplane upon its longitudinal stability in flight.

See also Stability.

Banking. Effects of Wind Upon the Stability and Maneuverability of an Airplane in Flight, Temple N. Joyce. Aviation, vol. 8, no. 1, Feb. 1, 1920, pp. 18-19, 2 figs. Diagrams showing action of plane banking both with and into wind.

Bantam. See B. A. T.

Basilisk. See B. A. T.

B. A. T. B. A. T. Types. Aerial Age, vol. 10, no. 8, Nov. 24 and Dec. 1, 1919, pp. 287-288, 3 figs. Characteristics of F. K. 27, Basilisk and Bantam types.

Blériot. See Paris Show.

Boulton & Paul. The Boulton and Paul P-10 All-Metal Two Seater, General Purpose Biplane. Eng. Division Air Service, Technical Orders, no. 14, March 1920, pp. 83-86, 4 figs. Specifications: overall length, 26 ft.; wing span, 30 ft.; height, 12 ft.; weight, total 1700 lb.; speed, fully loaded, at 1000 ft., 104 m.p.h.; climb, fully loaded to 5000 ft., 8 min.; ceiling, 14,000 ft.

The Boulton & Paul Commercial Machine. Aerial Age, vol. 11, no. 9, May 10, 1920, pp. 290-292, 4 figs., also in Flight, vol. 11, no. 44, Oct. 30, 1919, pp. 1416-1422, 16 figs. Specifications: Weight, loaded, 7000 lb.; speed at 10,000 ft., 149 m.p.h., at 15,000 ft., 142 m.p.h.; climb to 10,000 ft., 8 min.; to 15,000 ft., 15 min.; ceiling, 25,000 ft.; load per sq. ft., 8.4 lb.; load per hp., 7.7 lb.; fitted with two 45-hp. Napier Lion engines.

Bracing, Internal. See Aerofoils.

Breguet Commercial. The Breguet Commercial Aeroplane, Model XIV. Aerial Age Weekly, vol. 10, no. 13, Jan. 12, 1920, p. 504, 1 fig. Principal characteristics are: Total length, 9 m.; height, 3.3 m.; carrying surface, 49 sq. m.; fuel capacity, 300 l.; duration of flight, 4 hr.

Breguet-Lugatti. See Paris Show.

Bristol. The Bristol Coupé and Hydro-Airplane. Aviation, vol. 7, no. 6, Oct. 15, 1919, p. 265, 1 fig. Principal particulars are: Weight loaded, 2800 lb.; overall length, 25 ft. 9 in.; wing span, 29 ft. 3 in.; climb, 6500 ft. in 18 min.

The "Bristol" Coupe: 275 HP. Rolls-

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Royce Falcon. Flight, vol. 11, no. 43, Oct. 23, 1919, pp. 1390-1391, 2 figs. Military type refitted for commercial service by adding roof to rear portion of fuselage. Also in Aeronautics, vol. 17, no. 313, Oct. 16, 1919, p. 363, 2 figs.

The "Bristol" Tourer. Flight, vol. 11, no. 45, Nov. 6, 1919, p. 1452, 1 fig. General specifications are: Weight, loaded, 2800 lb.; wing span, 39 ft. 3 in.; overall length, 25 ft. 9 in.; ceiling, 20,000 ft.

British. A British Air Limousine. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1070-1071, 5 figs. Chief specifications are: Engine, Rolls-Royce Falcon Mark III; span, 38 ft. 2 in.; length, 28 ft. 6 in.; height, 10 ft. 9 in.; weight, 3,400 lb.

British Air Ministry Competitions. Air Ministry Competitions, 1920. Eng., vol. 110, no. 2854, Sept. 10, 1920, p. 343. Table of data regarding large and small aeroplanes arranged alphabetically in each class.

The Air Ministry Competition at Martlesham. Flight, vol. 12, no. 32, Aug. 5, 1920, pp. 855-861, 13 figs. Mechanical details of machines entered.

British and French Types. The Paris Show. Aeronautics, vol. 18, nos. 324 and 325, Jan. 1 and 8, 1920, pp. 9-19, 16 figs., and 37-42, 11 figs. Specifications of British and French types exhibited.

The Paris Auto Show at a Glance. Flight, vol. 12, no. 1, Jan. 1, 1920, pp. 16-17, 44 figs. Tabulated particulars of all machines.

The Paris Auto Show 1919. Flight, vol. 11, nos. 51 and 52, Dec. 18 and 25, 1919, pp. 1611-1616, 18 figs., and 1642-1646, 30 figs. Also vol. 12, no. 1, Jan. 1, 1920, pp. 5-15, 42 figs. General features and structural characteristics of French and British models exhibited.

Caproni, American-Built. The American-Built Caproni Biplane. Flight, vol. 12, no. 15, Apr. 8, 1920, pp. 389-392, 8 figs. Characteristics: span, both planes, 49 ft.; chord, 9 ft.; gap, 9 ft.; overall length, 41 ft. 3 in.; overall height, 14 ft. 8 in.; angle of incidence, 5 deg. 30 min.; power plant, three Liberty 12 engines, low-compression, of 330 hp. each; weight fully loaded, 12,931 lb.; speed ground level, 105 m.p.h.

Cato. Simplicity Marks Design of Cato Monoplane and Engine. Automotive Manufacturer, vol. 61, no. 11, Feb. 1920, pp. 23-26, 4 figs. Specifications: overall span, 28 ft. 11½ in.; overall length, 20 ft. 10 in.; chord, 7 ft.; total plane area, 186 sq. ft.; weight fully loaded, 727 lb.; high speed at low altitude, 68 m.p.h.; landing speed, 25 m.p.h.; climb in 10 minutes, 4500 ft.; ceiling, 12,000 ft.

The Cato Sporting Monoplane. Aeronautics, vol. 17, no. 311, Oct. 2, 1919, pp. 332-333, 4 figs. Also Aerial Age, vol. 10, no. 4, Oct. 6, 1919, pp. 126-127. Principal data are: Overall span, 28 ft. 11½ in.; overall length, 20 ft. 10 in.; weight fully loaded, 27 lb.; high speed at low altitude, 68 miles per hr.; climb in 10 min., 4500 ft.; ceiling, 12,000 ft.

Ceiling. Occasional Papers on Aeronautics, A. R. Low. Aeronautics, vol. 18, no. 334, March 11, 1920, pp. 223-225, 1 fig. Method of estimating relation between "ceiling" height and excess of available engine power at standard sea level.

Centaur. Central Aircraft Types. Aerial Age, vol. 11, no. 1, Mar. 15, 1920, pp. 20-22, 5 figs. Centaur type of machines for civil aviation built by Central Aircraft Co., Lond.

Centering of. Centering of Aeroplanes (Centrage des avions), L. Huguet. Vie Technique et Industrielle, vol. 1, no. 10, July 1920, pp. 303-306, 2 figs. Technical study of best position for center of gravity.

Chicago Show. Impressions of the Chicago Aeronautical Show, Alexander Klemin. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 522-525, 1 fig. Dominant feature which impressed writer was commercial character of show, the machines exhibited being mostly transport and pleasure types.

The Chicago Aeronautical Show. Aerial Age, vol. 10, no. 12, Jan. 5, 1919, pp. 443-454, 11 figs. Also Aviation, vol. 7, no. 11, Jan. 1, 1920, pp. 470-474, 5 figs. Particulars of some of the machines exhibited.

Clerget. See Paris Show.

Climbing. Computations of Airplane Climb, F. W. Caldwell. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 355-356. Examples of calculation of climbing rate with fixed-blade propeller.

Graphic Determination of Climb of an Aeroplane from the Barogram (Graphische Bestimmung des Steigmasses eines Flugzeuges aus dem Barogramm), E. v. Lössl. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 10, no. 23-24, Dec. 27, 1919, pp. 274-277, 4 figs. Method is outlined for studying aerodynamic quality of an aeroplane by characteristic ratio.

Measurements of Energy through Climbing and Gliding Flights (Energiemessungen durch Steig- und Gleitflüge), Georg König. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 12, June 30, 1920, pp. 170-173, 8 figs. Describes measuring method developed by author and the two instruments required in connection therewith, a speed meter and a baragraph. Merits of method are demonstrated. From address before Sci. Soc. for Aviation.

Commercial. The Commercial Airplane in Its Present Day Development, George E. Quisenberry. Automotive Industries, vol. 42, no. 18, April 29, 1920, pp. 998-1001, 4 figs. Progress made in Europe is specially pointed out, and in this connection reference is made to Caproni triplanes having seating capacity of 20 passengers, Airco nine-passenger single-engine plane designed for London-Continental service, and proposed Grahame-White nine-seater limousine which mounts two 320 hp., Rolls-Royce Eagle V engines.

The Commercial Future of the Large Airplane, W. H. Barling. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 822-823. For development of commercial service writer looks to large multi-engined airplane. It discusses possibilities of constructing 40,000-lb. machine.

See also Boulton & Paul; Breguet; D. F. W.; Lawson; L. F. W. Owl Freight; Pacific Hawk; Sopwith; Vickers.

Commercial Possibilities. Air Mail Shows Commercial Possibilities of Planes, Otto Praeger. Automotive Industries, vol. 42, no. 13, Mar. 25, 1920, pp. 743-745. Records of operation of air mail for period of almost two years are quoted as evidence that "the airplane has that degree of dependability of operation in the air which is essential to commercial utility."

The Airplane as a Commercial Possibility, D. W. Douglas. Jl. Soc. Automotive Engrs., vol. 5, no. 6, Dec. 1919, pp. 388-394. Three possible methods of establishing commercial air service are mentioned: (1) Scheduled regular service; (2) special taxi service; (3) tourist service. Efforts undertaken by various manufacturers to develop commercial service in one of these three ways are explained and data on costs, maintenance and traffic so far secured are quoted.

Construction. Brazing, Welding and Soldering in Aeroplane Construction, B. C. Boulton. Aerial Age, vol. 10, no. 4, Oct. 6, 1919, pp. 119-121,

4 figs. Purposes for which each process is best suited.

Cable Lengths and Fitting Angles, Norman L. Kearney. Aerial Age, vol. 10, no. 20, March 1, 1920, pp. 724-725, 4 figs. System of coördinates is suggested for establishing location points throughout aeroplane similar to surveyor's method of fixing bench marks and architect's scheme of establishing floor levels.

Cast Metal Parts in Aeroplane Construction, Walter J. May. English Mech., vol. 110, no. 2852, Nov. 21, 1919, pp. 205-206, 5 figs. How various foundry practices affect strength of metal.

See also Assembling; Metal Construction; Timber Splices.

Construction Materials. See AIRCRAFT CONSTRUCTION MATERIALS.

Control Surfaces. See AIRCRAFT, Control Surfaces.

Cowling, Safety. New Safety Cowling Designed to Eliminate Injury to Face. Aerial Age, vol. 11, no. 17, July 5, 1920, p. 583, 3 figs. Original line of cowling is cut away in a U-shaped opening in front of pilot's head.

Cruising Radius, Maximum. Maximum Cruising Radius and Maximum Speed Which an Aeroplane Can Attain Under Present Conditions (Sur les plus grandes distances franchissables par les avions et les plus grandes vitesses realisables), A. Rateau. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 7, Feb. 16, 1920, pp. 364-370. Formulæ are developed which express speed and cruising radius in terms of propeller recoil, weight of aeroplane, etc. Assuming values corresponding to best performances on record and also best air conditions possible it is found that maximum cruising radius possible is about 4300 mi. and maximum attainable speed about 287 mi. per hr.

Curtiss Eagle. The Curtiss Eagle Transport Airplane. Aviation, vol. 7, no. 7, Nov. 1, 1919, p. 309, 1 fig. Tractor fuselage biplane fitted with additional wing engines and propellers.

The New Curtiss Eagle Cabin Plane. Aviation, vol. 8, no. 3, Mar. 1, 1920, pp. 98-99, 2 figs. Specifications: Span, 36 ft. 4 in.; overall length, 36 ft. 7¼ in.; overall height, 12 ft. 11 in.; net weight, 5310 lb.; gross weight, 8890 lb.

Dayton-Wright. Report of Static Test on DH-4 (Dayton-Wright) Tail Surfaces. Air Service Information Circular, vol. 1, no. 23, Mar. 31, 1920, 7 pp., 4 figs. Elevator, stabilizer, and rudder satisfactory. Fin not tested but held on previous tests and is regarded safe.

Report of Static Test of the Fuselage of the D.H.-4 (Dayton-Wright). Air Service Information Circular, Eng. Div., Air Service, vol. 1, no. 34, May 8, 1920, 1 p., 6 figs. Test showed fuselage to be satisfactory, holding a load factor of 5.

Depreciation. Aircraft Depreciation. The Air Board of Canada, Bul. no. 1, May 1920, 6 pp. Also Flight, vol. 12, no. 40, Sept. 30, 1920, pp. 1039-1040, and Aeronautics, vol. 19, no. 363, Sept. 30, 1920, pp. 246-247. It is calculated that total allowance in computing cost of operations or insurance and depreciation upon new machines valued at $10,000 and used for a period of six months during which it was flown 300 hr. should be $6786, or 67 4/5 per cent of value of machines.

Design. Characteristics of Design Affecting Production, Operation and Maintenance of Aircraft, Percy Bishop. Aeronautics, vol. 18, no. 332, Feb. 26, 1920, pp. 200-205. Paper read before Royal Aeronautical Society.

Determination of Sweepback for Line-Up, T. P. Wright. Aviation, vol. 8, no. 10, June 15, 1920, p. 394, 2 figs. Formula for determining increase in stagger from wing root to wing tip.

Flying Altitude at Which Fuel and Oil Consumption of a Given Aeroplane Is a Minimum, and Best Type of Propeller to Use (Sur l'altitude de vol qui correspond au minimum de consommation kilométrique, et sur le calcul de la meilleure hélice pour un avion donné), A. Rateau. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 9, Mar. 1, 1920, pp. 491-497. Formulæ are developed and interpreted. In consequence of passive resistances of motor, altitude at which fuel and oil consumption is minimum is at about 500 ft. below ceiling of aeroplane, and there is margin of about 1300 ft. in which variation is less than one per cent. Selection of propeller for aeroplane of given characteristics is discussed both when propeller is to be fixed on shaft of motor and when it is to be operated through speed-reducing gears.

Handbook of Instructions for Airplane Designers. Eng. Division Air Service, Feb. 1920, 142 pp., 77 figs. It is divided into the following sections: Airplane design (materials, structures, etc.); propellers; power plant installation; armament installation; equipment installation; and weight schedule.

Influence of a Change of the Overall Length of Plane on the Climbing Capacities of an Aeroplane (Einfluss einer Aenderung des Flugelausmasses auf die Steigleistungen eines Flugzeugs), F. Gabriel. Motorwagen, vol. 23, nos. 8-9, Mar. 20-31, 1920, pp. 148-155, 6 figs. A simple, chiefly graphical method of calculation for determining alteration in overall length of plane under given conditions necessary for aeroplane to reach a given altitude from earth surface in a minimum of time.

The Aeroplane of Consistent Strength, A. J. Sutton Pippard. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 133-134. Method of design is suggested in which strength is specified in terms of load factor of wings with center of pressure in its most forward position.

The Case for the Cantilever Wing. Flight, vol. 12, no. 11, Mar. 11, 1920, pp. 285-288, 8 figs. Plea for conducting investigations of aeroplanes with wings having no external wing bracing at National Physical Laboratory, England, is made on ground that more than 400 different wing sections were tested at National Gottingen Institute before device used in German machines was adopted. Estimate of character of thick tapering wing is based on published reports of tests at high speeds on six aerofoils suitable for airscrew design. (Reports and Memoranda No. 322.)

The Horsepower of Resistance in Airplane Design, N. L. Lieberman. Jl. Soc. Automotive Engrs., vol. 5, nos. 3 and 4. Sept. and Oct. 1919, pp. 252-261 and 321-324, 11 figs. Review of results obtained by various investigators. Notes on fluid motion; model study and dynamical similitudes; coefficients of resistance; panel area and resistance; distribution of horsepower consumption; burden distribution; flight at high altitude; etc.

The Structural Analysis and Design of the Aeroplane, B. C. Boulton. Aerial Age, vol. 11, nos. 22 and 23, Aug. 9 and 16, 1920, pp. 742-744, 10 figs., and 775-777, 4 figs. Calculations of internal stresses in members of structure. Formulæ for designing structural members made of wood and steel in combinations.

Trend of Airplane Design. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 170-189. Tables giving data relative to American and British commercial, military and naval aeroplanes are presented and principal charac-

teristics of several German machines are also included. It is particularly pointed out that by following methods of bridge designer in building up strength members and distribution of materials in proportion to stress, it has been learned that increase in size does not materially affect ratio between total and useful loads. Graphic comparison of wing areas, useful loads and total weights of four seaplanes considered as marking distinct steps in seaplane development is illustrated.

See also Loads and Stresses; AERODYNAMICS, Load and Resistance Equations; AVIATION, Developments in.

Detection of. Seeing in the Dark. Sci. Am., vol. 123, no. 7, Aug. 14, 1920, pp. 154 and 166-168, 5 figs. Thermopiles and holders for detecting aeroplanes in the dark.

D. F. W. The D. F. W. Giant Biplane. Aeronautics, vol. 18, no. 334, Mar. 11, 1920, pp. 215-217, 2 figs. Specifications: Weight empty, 8600 kg.; total weight, 12,460 kg.; span, 35 m.; total length, 21 m.; maximum height, 6.50 m.; wing area, 265 sq. m.; speed, 132 km. per hr.; number of passengers, 15. Translated from Automobil-Flugwelt.

The German D. F. W. Commercial Four Engined Biplane. Aerial Age, vol. 10, no. 9, Dec. 8 and 15, 1919, pp. 326-328, 4 figs. Machine is fitted with four 220-hp. Mercedes engines placed in fuselage and driving airscrews on wings by means of bevel gears and shafts.

Driving Gears. Aeroplane Driving Gears (Flugzeuggetriebe), W. G. Noack. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 15-16, 17-18 and 19-20, Apr. 17, May 1 and May 15, 1920, pp. 317-322, 346-350 and 377-381, 48 figs. Description of different types of drives for direct connection to engine, including noteworthy foreign designs and the so-called combined geared drive principally used for German giant planes. Notes on measurement of gears and their construction, lubrication and durability of drives, and description of the most important types of couplings for such drives.

Eagle. See Curtiss Eagle.

Emergency Flotation Gear. Description and Test of DeH-4 Emergency Flotation Gear. Eng. Division Air Service (Dayton, O.) Technical Orders no. 8, Sept. 1919, pp. 51-56, 11 figs. It is recommended that attempt be made to devise system for ejecting wheels by springs instead of by air.

Engines. See AEROPLANE ENGINES.

Fabrics. See AIRCRAFT CONSTRUCTION MATERIALS, Fabrics.

Fairey Amphibian. The Fairey Amphibian. Aeronautics, vol. 19, no. 362, Sept. 23, 1920, p. 223, 3 figs. Wings are fitted with variable camber flaps operated by hand-wheel at side of pilot's seat. Engine is 450 hp. Napier "Lion" fitted with hand and explosion starters.

Farman Goliath. The Farman Goliath Transport Airplane. Aviation, vol. 7, no. 11, Jan. 1, 1920, pp. 477-479, 5 figs. Twin-tractor biplane with main planes of equal spans and balanced control surfaces.

Fiat Passenger. Fiat Twelve-Passenger Aeroplane. Aerial Age, vol. 11, no. 6, Apr. 19, 1920, pp. 185-187, 7 figs. Specifications: Weight empty, 7040 lb.; useful load, 3960 lb.; maximum power of engine apparatus, 1850 r.p.m.—900 hp.; speed, over 125 mi. per hr.; and minimum speed, lower than 50 mi. per hr.

Fiat Twelve-Passenger Aeroplane. Aeronautics, vol. 18, no. 343, May 13, 1920, p. 377, 3 figs. Characteristics: Weight loaded, 11,000 lb.; power of engine, maximum, 900 hp. at 1850 r.p.m.; minimum, 700 hp. at 1600 r.p.m.

New Fiat Airplane and Engine. Aviation, vol. 8, no. 1, Feb. 1, 1920, p. 14, 2 figs. Two-place tractor biplane equipped with 12-cylinder 700-hp. Fiat engine.

Fighting. See CANNON, Gearing to Aeroplane Engines.

Fire Protection. Aeroplane Fires (La descent en flammes). Aérophile, vol. 28, nos. 3-4, Feb. 1-15, 1920, pp. 48-49. Manner in which aeroplanes caught fire in war operations is explained, and protective remedies devised by allied powers, notably France, are classified and briefly described.

Aviation and Fire Protection, W. T. Colyer. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 114-120. Fire hazards and methods which have been devised to protect air machines.

Flight. See Soaring Flight; FLIGHT.

Flying Boats. See FLYING BOATS.

F. K. 27. See B. A. T.

Fokker. Report of Static Test of Fokker type D-VII Chassis. Air Service Information Circular, vol. 1, no. 29, April 2, 1920, 7 pp., 6 figs. Test to determine strength of chassis.

Foreign Data. Résumé of Foreign Data. Eng. Division Air Service (Dayton, O.) Technical Orders no. 8, Sept. 1919, pp. 83-90, 13 figs. Aeroplane reports issued in Great Britain, France and Germany.

Free-Flight Tests. Preliminary Report on Free Flight Tests, E. P. Warner and F. H. Norton. Nat. Advisory Committee for Aeronautics, no. 70, 1920, 33 pp., 33 figs. Tests were made on two training machines of JN4H type, both of which were equipped with Hispano-Suiza 150-hp. engines.

Freight. See L. W. F. Owl Freight.

Fuselage Design. The Design of Monocoque Fuselages, Armin Elmendorf. Aviation, vol. 9, no. 4, Sept. 15, 1920, pp. 112-114, 5 figs. Discussion is limited to true monocoque fuselage in which no longitudinal reinforcing is used, and all stresses, both flexural and shear, are therefore carried by fuselage shell. Points out that monocoque fuselage must be designed so as to get maximum buckling strength.

Fuselage Stresses. Analysis of Fuselage Stresses, Edward P. Warner and Roy G. Miller. Nat. Advisory Committee for Aeronautics, no. 76, 1920, 15 pp., 2 figs. Graphical study of landing and flying loads coming upon fuselage of shape as that in JN4H machine.

Gallaudet. The Gallaudet C-3 Liberty Tourist Plane. Aerial Age, vol. 11, no. 23, Aug. 16, 1920, p. 771, 3 figs. Dimensions: Length overall, 29 ft. 5 in.; wing span, 44 ft.; height, 10 ft. 3 in.; wing area, 48 sq. ft.; weight loaded, 3800 lb.; cruising radius, 500 miles; ceiling, 18,000 ft.; maximum speed, 125 m.p.h. Built by Gallaudet Aircraft Corporation, East Greenwich, R. I.

Gasoline Tanks. Covering Wing Gasoline Tanks in Martin Bomber. Air Service Information Circular, vol. 2, no. 105, Aug. 20, 1920, 3 pp., 3 figs. Illustrates method.

The Imber Self-Sealing Petrol Tank. Flight, vol. 11, no. 50, Dec. 11, 1919, pp. 1591-1592, 5 figs. Tank is protected with resilient outer rubber covering.

German. German Giant Airplanes (Les avions géants allemands), G. Crouvezier. Aérophile, vol. 27, nos. 15 and 16, Aug. 1-15, 1919, pp. 241-245, 8 figs. Design features of various types.

Some Recent German Airplanes. Aviation, vol. 8, no. 1, Feb. 1, 1920, pp. 20-22, 16 figs. Examples of large triplane design.

The development in Construction of Large

German Flying Machines (Die Entwickelung des deutschen Riesenflugzeugbaues während des Krieges), A. Baumann. Zeitschrift des Vereines deutscher Ingenieure, vols. 63 and 64, nos. 51, 4, 5 and 6, Dec. 20, 1919, Jan. 24, 31 and Feb. 7, 1920, pp. 1275-1281, 78-83, 112-116 and 129-134, 68 figs. Details and illustrations of the various types. Specifications are: Staaken: Weight, 8500 kg.; capacity, 3200 kg.; engine, four 260-hp. motors, speed, 130 to 140 km. per hr., etc. Siemens-Schuckert, 1917: span, 48 m.; overall length, 22 m.; height, 7.5 m.; weight, 11,000 kg.; capacity, 5300 kg. German Aerial Machine Works, 1918: span, 35 m.; total length, 21 m.; total height, 6.5 m.; weight, 8600 kg.; capacity, 3400 kg.; speed, 132 km. per hr.; passengers, 15; crew, 6. Dornier hydromonoplane, 1917: span, 36 m.; length, 22.74 m.; height, 8.1 m.; weight, 7200 kg.; capacity, 3470 kg.; engine, four 260-hp. Maybach motors. General Electric Co. (A.E.G.): span, 36 m.; weight, 9000 kg.; capacity, 3700 kg.; engine, four 260-hp. Mercedes motors.

See also Aviatik; D. W. F.

Gliding. Velocity and Stresses in a Glide, J. C. Hunsaker. Aviation, vol. 7, no. 12, Jan. 15. 1920, pp. 539-540, 2 figs. Experiments at University of Paris, where it was found that propeller cranked engine as windmill and absorbed power equivalent to additional resistance of about 20 per cent are quoted, and opinion is expressed that it is probable that an engine throttled down to minimum revolutions is more effective brake on glide than when stopped dead.

Gourdou-Lesseurre Pursuit. The Gourdou-Lesseurre Pursuit Airplane, Charles Gourdou. Aviation, vol. 8, no. 6, April 15, 1920, pp. 243-245, 5 figs. Characteristics: span, 30.8 ft.; length, 21.1 ft.; height, 7.8 ft.; wing area, 202.3 sq. ft.; aileron area, 23.7 sq. ft.; stabilizer area, 13.8 sq. ft.; useful load, 374 lb.; weight empty, 1254 lb.; ceiling, 24,600 ft.

Grahame-White Limousine. The Grahame-White E-8 Nine-Seater Limousine. Flight, vol. 12, no. 13, Mar. 25, 1920, pp. 335-337, 7 figs. Notable feature of control is mounting of rudder-bar below floor with pedals projecting through and sliding in slots in floorboards.

Gun Mounts. See GUN MOUNTS, Aeroplanes.

Hangars. See HANGARS.

Head Resistance. Head Resistance Due to Radiators. Nat. Advisory Committee for Aeronautics, report no. 61, 1920, 22 pp., 40 figs. Head resistance of various types of core was found to vary greatly; lowest was Candler ⅜-in. hexagonal tube, 8 lb. per sq. ft. at 90 mi. per hr., while highest was fin and tube type, 22 lb. per sq. ft. at 90 mi. per hr. Wind-tunnel tests showed that at any given plane speed total resistance of fuselage with flat nose radiator is increased by increasing air flow through radiator either by opening exit vents for air or by decreasing resistance of radiator to passage of air. Tests of radiator inclosed in streamlined casing showed that head resistance can be decreased by as much as 50 per cent, but accompanying decrease in mass flow of air nullifies advantage gained.

Helicopters. See HELICOPTERS.

Hild-Marshonet. The Hild-Marshonet Sportplane. Aerial Age, vol. 10, no. 11, Dec. 29, 1919, pp. 400-401, 9 figs. General characteristics are: spread overall, 24 ft.; length, 19 ft.; weight, loaded with pilot and fuel for three hours, 700 lb.; speed range, 35-65 m.p.h.

The Hild-Marshonet Sport Plane. Flight, vol. 12, no. 13, Mar. 25, 1920, pp. 347-349, 9 figs. Dimensions: Span, top plane 24 ft., lower plane 19 ft. 3 in.; chord, top plane 5 ft. to 3 ft., lower plane 4 ft. 6 in. to 3 ft.; overall length, 19 ft.; angle of incidence, 4 deg.; factor of safety throughout, 7; weight of machine, empty, 450 lb.; weight fully loaded, all on for three hours, 700 lb.; speed range (40-hp. engine), 35-65 m.p.h.; climb, 780 ft. per min.; glide, 1 in 8.

Hydroplanes. See Bristol.

Incidence Wires. Incidence Wires, Hilda P. Hudson. Aeronautical Jl., vol. 24, no. 117, Sept. 1920, pp. 505-516, 3 figs. Inclusion of incidence wires in strength calculations by method of strain energy. Little difference is found in normal flight conditions, but inclusion shows large changes in wing loads in nose diving and in center section loads with broken flying wire.

International Exhibition. The International Aero Exhibition. Engr., vol. 130, no. 3369, July 23, 1920, pp. 78-80 and p. 86, 8 figs. Particulars of Lion, Tiger and Siddeley engines. Description of Avro five-seater passenger triplane, and of Calthrop quick-release device for parachutes.

Junker. Design and Structure of the German Metal Airplane. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1360-1362, 9 figs. Specifications: Total weight, 4569 lb.; engine, 230 hp. Benz.; crew, pilot, observer and gunner; fuel capacity, 26 gal.; oil capacity, 10 gal.; total wing area, 533.5 sq. ft.; power loading, 8.56 lb. per sq. ft.; wing loading, 8.56 lb. per sq. ft.

Junker All-Metal Monoplane. Technical Orders, no. 9, Oct. 1919, pp. 123-125, 3 figs. Unique features are: Entire absence of wing-bracing struts or wires; monoplane form with fuselage; and location of nearly all weight high above wing, arrangement which gives remarkable visibility but seemingly poor stability.

Report on the Junker Armoured Two-Seater Biplane, Type J. 1. Flight, vol. 12, nos. 9, 10, 11 and 12, Feb. 26, Mar. 4, 11 and 18, 1920, pp. 229-233, 7 figs., 262-265, 13 figs., 290-293, 10 figs., and 315-318, 5 figs. Feb. 26: Specifications: Weight empty, 3724 lb.; engine, 230 hp. Benz.; leading per sq. ft., 8.56 lb. Mar. 4; Arrangement of seats. Mar. 11: Junker control system and details of transverse bulkhead at engine bed. Mar. 18: Translation of German instruction manual for Junker biplane.

The Junker Armored Two-Seater Biplane, Type J. 1. Aviation, vol. 8, no. 7, May 1, 1920, pp. 285-289, 8 figs. Specifications: Engine 230 hp. Benz.; gasoline capacity, 26 gal.; total weight, 4569 lb.; oil capacity, 10 gal.; crew, two, pilot and observer gunner; overall length, 29 ft. 8 in.; span, upper plane, 55 ft., lower plane, 35 ft. 7 in.; overall height, 11 ft. 9 in.

The Junker Single-Seater All-Metal Monoplane, Type D1. Flight, vol. 12, nos. 14, 15 and 16, Apr. 1, 8 and 15, 1920, pp. 376-380, 7 figs., 394-396, 7 figs., 419-422, 12 figs. Apr. 1: Characteristics: Span, 29 ft. 2 in.; overall length, 22 ft.; maximum height, 9 ft. 5 in.; total supporting surface, 158.8 sq. ft.; engine, 180 hp. Mercédès. Apr. 8: Body consists of framework of duralumin formers covered by single riveted-on skin of sheet duralumin corrugated lengthwise. Apr. 15: Corrugated fuselage covering finishes in vertical plane just in front of tail planes and rear body portion is built up integrally with fixed tail planes. Armament consists of two Spandau guns fixed on channel duralumin bearers immediately in front of pilot.

Knots. The Employment of Knots in the Construction of Aeroplanes (Ueber die Anwendung des Knotens im Flugzeugbau), Ludwig Grüter. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 10, nos. 23-24, Dec. 27, 1919, pp.

267-270, 24 figs. Description and illustrations of various forms of knots, of which one is specially recommended, directions being given for most practical manner of making it.

Lacoin-Damblanc. The Great Problem of Stationary Flying (Le grand problème du vol sans vitesse), Ernest Archdeacon. Aérophile, vol. 28, nos. 11-12, June 1-15, 1920, pp. 168-172, 3 figs. Description of the "Alerion," an aeroplane invented by MM. Lacoin and Damblanc, which is said to be capable of rising directly vertically and supporting itself in the air. Machine carries two four-bladed propellers which rotate in horizontal planes for vertical flight, and at inclined angle for advancing forward.

Laddon Night Pursuit. Report on Wind Tunnel Test of Laddon Night Pursuit Airplane. Air Service Information Circular, vol. 1, no. 33, May 5, 1920, 10 pp., 6 figs. Object of test was to determine best stabilizer setting for normal setting of wings with no decalage, and to determine effect on gliding angle and on stability of varying angle of lower wing relative to upper wing with stabilizer constant at 1 deg. to upper wing chord.

Laird "Swallow." The Laird "Swallow." Aviation, vol. 9, no. 4, Sept. 15, 1920, pp. 119-120, 2 figs. Specifications: Passengers, 2; crew, 1; engine, Curtiss OX-5, 90-hp.; weight empty, 1075 lb.; weight loaded, 1750 lb.; span, 36 ft.; overall length, 23 ft. 4 in.; overall height, 8 ft. 8 in.; range at full speed, 255 mi.; max. speed, 86 m.p.h.

Landing. Airbrakes and the Sideslip Landing, F. T. Courtney. Flight, vol. 12, no. 14, April 1, 1920, pp. 368-369, 2 figs. Criticises prohibition of sideslip form of landing for commercial purpose. It is argued that this landing is not a "stunt," is not difficult or dangerous and "is the simplest form of employing the airbrake that has been or is likely to be devised.

Landing Run and Get-Away for Standard Airplanes, Alexander Klemin. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 231-236, 9 figs. Technical study of various systems of braking and of devices for shortening landing runs. Reference is made to investigations by Nat. Advisory Committee for Aeronautics, from which investigations it is concluded that for a given size of propeller, wide blades have a larger brake effect than narrow blades, and that brake effect of higher-pitch propeller is less than that of lower-pitch propeller.

Slow Flying of Aeroplanes (Les régimes lents, en aviation), Auguste Forissier. Génie Civil, vol. 76, no. 8, Feb. 21, 1920, pp. 205-207, 5 figs. Technical study of lowering speed by variation of incidence of wings or variation of wing area. Importance of devising method of lowering speed is pointed out as possible means of permitting landing in reduced space.

Landing Chassis. Report of Static Test of the Landing Chassis of DH-4-P-34. Air Service Information Circular, vol. 1, no. 38, May 8, 1920, 8 pp., 5 figs. Axle of chassis is one continuous piece of steel tubing. Shock absorbers consist of four units of eight loops each and are made of 9/16-in. elastic cord. Weight of chassis is 147 lb., of frame used for attaching it to jig 140 lb., and of jig itself 1075 lb. Chassis was found satisfactory in every respect.

Landing Gears. Ski Landing Gears for Airplanes. Aviation, vol. 8, no. 9, June 1, 1920, p. 369, 3 figs. Design developed by United States Air Mail Service.

Large, Limitations of. The Large Aeroplane and its Limitations, A. Ryan. Aeronautical Jl., vol. 23, no. 106, Oct. 1919, pp. 530-537. Effects of increasing size under following conditions: (1) all sizes to have same speed, (2) loss per sq. ft. of surface same for all sizes and (3) density of atmosphere constant.

Launching from Ships. A Compressed Air Operated Catapult for Launching Airplanes from Ships. Compressed Air Mag., vol. 25, no. 1, Jan. 1920, p. 9502, 3 figs. Device consists of straight-pull air cylinder operated through tackle attached to launching car on trackway.

Lawson. Air Liner Is Designed for Commerce. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 964-967, 4 figs. Details of construction of twin-motor Lawson C-2.

The Lawson Airplane C-2. Aviation, vol. 7, no. 7, Nov. 1, 1919, pp. 315-316, 1 fig. Structural characteristics are: overall length, 48 ft.; overall height, 15 ft.; span of upper and lower wings, 91 ft.; total weight loaded, 13,-929 lb.

Lincoln Standard Speedster. The Lincoln Standard Speedster. Aerial Age, vol. 11, no. 22, Aug. 9, 1920, pp. 740-741, 5 figs. Characteristics: Length overall, 25 ft. 8 in.; height overall, 10 ft.; span, 32 ft.; chord, 6 ft.; weight loaded, 2150; hp., 150 or 180 Hispano-Suiza; climb, loaded, 5000 ft. in 10 min.; speed, maximum, 107 m.p.h.

Linke-Hoffman. The Linke-Hoffman Central Power Plant Giant Biplanes, Eric Hildesheim. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 391-393, 10 figs.

The Linke-Hoffman Giant Machines. Aerial Age, vol. 10, no. 14, Jan. 19, 1920, pp. 533-535, 7 figs. Machine has single tractor airscrew driven by four Mercedes engines of 260 hp. each. Span, 138 ft. 6 in.; length, 67 ft.; height, 23 ft. 6 in.; wing area, 3440 sq. ft.; useful load, 9000 lb., including fuel for 7-hr. flight.

Load Factors. Load Factors for Aeroplanes and Seaplanes. Eng., vol. 109, no. 2833, Apr. 16, 1920, p. 511. Report of sub-committee appointed by Advisory Committee for Aeronautics to consider and report "as to the definite rules which should be adopted to govern the load factors required for all classes of civil aircraft, and upon which certificates of airworthiness may be based."

Load Factors for Heavier-Than-Air Craft. Flight, vol. 12, no. 10, Mar. 4, 1920, pp. 260-261. Report of sub-committee appointed by Advisory Committee for Aeronautics to consider and report as to definite rules which should be adopted to govern load factors required for all classes of civil aircraft and upon which certificates of airworthiness may be based.

Schedule of Load Factors for Heavier-than-Air Craft. Eng. & Indus. Management, vol. 3, no. 11, March 11, 1920, pp. 332-333. Report adopted by sub-committee appointed by Advisory Committee for Aeronautics to consider and report as to definite rules which should be adopted to govern load factors required for all classes of civil aircraft, and upon which certificates of airworthiness may be based.

Loads and Stresses. Deflection of Supporting Plane and Stresses in Material (Tragflächendurchbiegung und Stoffbeanspruchung), A. Proll. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 11 and 12, June 28, 1919, pp. 121-124, 6 figs. Curves and equations.

The Loads and Stresses on Aeroplanes, John Case. Aeronautics, serial running from vol. 17, no. 309, Sept. 18, 1919 (beginning on p. 289), to vol. 18, no. 349, June 24, 1920. Systems of bracing employed in triplanes. Design of spar sections. Study of stresses produced during steep dives. Calculation of loads due to lift reactions. Formulæ for stresses

in a spar. Table showing bending moment, shearing forces, stresses, etc., obtained by different methods; design of spars for bottom wing. Movement of points of support; theory of continuous beams. Calculation of stresses due to lateral bending. Estimating stresses due to bending in each spar. Method of determining dimensions of parallel solid strut. Formula for crippling load of elliptically tapered strut. Design of struts and ribs; results of experiments of parallel spruce struts. Determining failing loads of struts. Hollow tapered wooden struts. Results of tests on tubular steel struts. Theory of composity struts. Euler failing load of symmetrical strut of any taper. Design of short tapered strut. Load curves for ribs. Initial stresses in ribs due to fabric. Torque diagram for aileron spar, and example of aileron calculation. Formulas for computing torsion of spars of various sections. Stresses in spar under combined bending and twisting. Equations of moments in spars. Elastic properties of wood in torsion.

Loughead. The Loughead Sport Biplane. Aerial Age, vol. 11, no. 13, June 7, 1920, pp. 434-435. Also in Aviation, vol. 8, no. 9, June 1, 1920, pp. 367-368, 1 fig. Specifications: Maximum speed (full load—horizontal flight), 70 m.p.h.; landing speed, 25 m.p.h.; rate of climb, 700 ft.—first minute; service ceiling, 12,000 ft.; gliding angle, 10 to 1; weight, loaded, 600 lb.; fuel consumption, 50 m.p.gal.; range of flight (without replenishing fuel), 450 mi.; height, 7 ft. 3 in.; length, 20 ft.

L. W. F. Owl Freight. The L. W. F. Owl Freight Plane. Aviation, vol. 8, no. 3, Mar. 1, 1920, p. 103, 1 fig. Outstanding features are said to be the monocoque fuselage and nacelle, intercommunicating gasoline system and fire-extinguishing system.

Mail. See Martin Mail Planes.

Martin Mail Planes. New Glenn L. Martin Airplane. Aviation, vol. 7, no. 11, Jan. 1, 1920, pp. 475-476, 3 figs. Twin-motor mail planes. They are 71 ft. 5 in. from tip to tip, 46 ft. from nose to tail and 14 ft. high, and are equipped with two 400 hp. high-compression Liberty motors, one mounted on each wing.

Martinsyde. The Martinsyde Machines. Flight, vol. 12, no. 25, June 17, 1920, pp. 637-641, 9 figs. Table of dimensions and performances of various types.

Materials of Construction. See AIRCRAFT CONSTRUCTION MATERIALS.

Messenger. Report on Wind Tunnel Test of Messenger Airplane. Air Service Information Circular, vol. 1, no. 43, July 30, 1920, 7 pp., 4 figs. Model was tested for lift, drag, and L/D, for various angles of thrust line to wind, with stabilizer settings of $+1\frac{1}{2}$ deg. and $-1\frac{1}{2}$ deg.

Metal Construction. Metal Construction of Aircraft, A. P. Thurston. Aeronautical Jl., vol. 23, no. 105, Sept. 1919, pp. 473-512, 41 figs. Methods of design, kinds of materials used and method of testing specimens at various works in England.

Metal Construction in Aircraft. Metal Industry (Lond.), vol. 16, no. 8, Feb. 20, 1920, p. 150. Points out materials of construction for main-plane spars, ribs, etc. From paper by J. S. Nicholson read before Instn. Engrs. & Shipbuilders.

The Development of Metal Construction in Aircraft, J. S. Nicholson. Eng., vol. 109, nos. 2828, 2829 and 2830, Mar. 12, 19 and 26, 1920, pp. 357-362, 23 figs., 375-378, 9 figs., and 408-412, 15 figs. Notes on structural design of main planes and on developments which have recently taken place in construction of all-metal aeroplane. Brief résumé of scientific principles underlying design of struts and beams, and of struts with lateral loading, is included. Paper read before Instn. of Engrs. & Shipbuilders in Scotland.

Military. Orenco Military Airplanes. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 531-532, 4 figs. Specifications of type B, pursuit fighter; length, 21 ft. 6 in.; height 8 ft. 3 in.; weight, unloaded, 1666 lb.; engine, 300-hp. Hispano-Suiza.

The Development of German Military Aircraft During the War (Die Entwicklung deutscher Heeresflugzeuge im Kriege), W. Hoff. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 27 and 28, July 3 and 10, 1920, pp. 493-499 and 523-528, 38 figs. Describes most important exponents of different construction types with details of various construction parts. Data on number of German aeroplanes at the front and successful flights of the different types. Address delivered before Sci. Soc. for Aviation in Hamburg.

See also Armored; Laddon Night Pursuit; Orenco; Reconnaissance.

Models for Tests. Construction of Models for Tests in Wind Tunnels. Nat. Advisory Committee for Aeronautics, report no. 74, 1920, 19 pp., 47 figs. Process of manufacturing single aerofoil for determining aerodynamic properties of sections.

Naval. See Amphibian; Navy; Torpedoplanes.

Navigation of. See COMPASSES, Gyroscopic, Electrical; DIRECTION FINDERS.

New York Show. Aircraft Makers Exhibit the 1920 Commercial Models. Automotive Industries, vol. 42, no. 11, Mar. 11, 1920, pp. 643-649 and 653, 13 figs. Mechanical details of principal exhibits at New York Aircraft Show.

Impressions of Airplanes at the Show, Alexander Klemin. Aviation, vol. 8, no. 4, March 15, 1920, pp. 158-162, 13 figs. Notes on New York Aeronautical Show.

New York Aero Show. Flight, vol. 12, no. 14, April 1, 1920, pp. 370-373, 8 figs. Characteristics of principal models exhibited.

Technical Features of the New Aircraft Models. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 698-701, 2 figs. Notes on New York aircraft show.

The New York Aeronautical Exposition. Aerial Age, vol. 10, no. 21, March 8, 1920, pp. 763-775, 21 figs. Notes on principal exhibits.

Nieuport. The Nieuport "Nighthawk." Flight, vol. 11, no. 48, Nov. 27, 1919, pp. 1524-1532, 21 figs. Single-seater fitted with 320 hp. ABC Dragonfly engine. Main characteristics are: total weight, 2100 lb.; speed at 5000 ft., 150 m.p.h.; climb, 29,000 ft. in 20 min.; ceiling, 29,000 ft.

The Nieuport Two-Seater Nighthawk. Aerial Age, vol. 10, no. 18, Feb. 16, 1920, pp. 664-665. Specifications: Engine, 320-hp. ABC; wing area, 270 sq. ft.; total weight, 1044 lb.

Nighthawk. See Nieuport.

Olympia Show. Commercial Development Rules Olympia Aero Show. Automotive Industries, vol. 43, no. 7, Aug. 12, 1920, pp. 301-307 and p. 327, 15 figs. All-metal machine and amphibian plane exhibited are seen as beginnings of new lines of advance.

The Aero Show. Aeronautics, vol. 19, nos. 352 and 353, July 15 and 22, 1920, pp. 51-59, 11 figs., and 71-82, 12 figs. Description of different types of planes, engines and accessories.

The International Aero Exhibition. Engr., vol. 130, no. 3368, July 16, 1920, pp. 52-54 and p. 62, 17 figs. partly on supp. plate. Models exhibited.

The Olympia Aero Show 1920. Flight, vol.

12, nos. 29 and 30, July 15 and 22, 1920, pp. 749-761, 29 figs., and 793-806, 40 figs. Description of planes, engines, and accessories exhibited.

Orenco. Orenco Commercial and Military Types. Aerial Age, vol. 2, no. 3, March 29, 1920, pp. 84-86 and p. 98, 11 figs. General features of types brought out by Ordnance Engineering Corporation.

Some "Orenco" (U. S. A.) Aeroplanes. Flight, vol. 12, no. 14, April 1, 1920, pp. 363-366, 15 figs. Specifications and dimensions of military aeroplanes built by Ordnance Engineering Corporation.

The Orenco Type "F" Tourister Aeroplane. Aerial Age, vol. 11, no. 8, May 3, 1920, pp. 253-256, 10 figs. Commercial design of Ordnance Eng. Corpn. Specifications: Engine, Hispano-Suiza Model A, 150 hp.; weight fully loaded, 2432 lb.; useful load, 955 lb.; range at full speed, 250 miles; speed near ground, 90 m.p.h.; at 5000 ft., 84 m.p.h.; at 10,000 ft., 78 m.p.h.; climb to 15,000 ft., 62 min.; overall length, 25 ft. 10 in.; overall height, 9 ft.; span, 38 ft.

The Orenco Type "F" Tourister Aeroplane. Flight, vol. 12, no. 25, June 17, 1920, pp. 644-648, 10 figs.

The Orenco Type F Tourister Airplane. Aviation, vol. 8, no. 7, May 1, 1920, pp. 278-281, 7 figs.

See also Military.

Over-Water Flight. Safety of Airplanes in Oceanic Flights (La sécurité des avions dans les traversées maritimes), G. Blanchet. Aérophile, vol. 27, nos. 17 and 18, Sept. 1-15, 1919, pp. 273-274, 9 figs. Collapsible floating device which may be filled instantly with compressed air.

Pacific Hawk. The Pacific Hawk Commercial Airplane. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 47-48, 2 figs. Data: Overall length, 32 ft.; overall height, 10 ft. 8 in.; span, 52 ft.; total weight, loaded, 3950 lb.; maximum speed, 82 m.p.h.; climb in 10 minutes, 4100 ft.

Parachutes. See PARACHUTES.

Paris Show. Aeroplanes in the Sixth Salon of the Paris Show (Les avions actuels et le 6 salon de l'Aéronautique). Aérophile, vol. 28, no. 3-4, Feb. 1-15, 1920, pp. 33-47, 43 figs. Characteristics and dimensions of types exhibited.

Progress of Aviation as Shown by Models Exhibited at Paris Aeronautical Show (L'état actuel de l'aviation d'après la 6e exposition internationale de la locomotion aérienne), L. Marchis. Technique Moderne, vol. 12, no. 2, Feb. 1920, pp. 56-60, 7 figs.

The Paris Aviation Show. Engr., vol. 129, nos. 3341 and 3342, Jan. 9 and 16, 1920, p. 37 and pp. 63-64, 2 figs. Machines exhibited are believed to have shown that "there is a good, if limited, choice of big aeroplanes suitable for the transport of merchandise and passengers."

The Paris Aero Show 1919. Flight, vol. 12, nos. 4 and 5, Jan. 22 and 29, 1920, pp. 93-97, 12 figs., and 121-123, 6 figs. Particulars of Savoia, Blériot, Anzani, Breguet-Lugatti and Clerget aeroplanes.

The Paris Aeronautical Show. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 53-56, 14 figs. Notes specially progress made since 1913.

The Paris Aeronautical Show (Le salon de l'aéronautique), Jean-Abel Lafranc. Nature (Paris), no. 2393, Feb. 7, 1920, pp. 86-92, 15 figs. Notes on models exhibited.

The Paris Show. Aeronautics, vol. 17, nos. 322 and 323, Dec. 18 and 25, 1919, pp. 543-550, 15 figs., and 567-574, 19 figs. Specifications of types exhibited.

The Sixth International Exposition of Aerial Locomotion (La 6e exposition internationale de locomotion aérienne), G. Espitallier. Génie Civil, vol. 76, no. 2, Jan. 10, 1920, pp. 29-35, 16 figs. Exhibits at Paris show (Dec. 1919) demonstrate, in writer's opinion, that aeronautical industry has successfully established itself on commercial basis.

Types Exhibited at the Paris Aeronautical Show (Les avions actuels et le 6e salon de l'Aéronautique), L. Marchis. Aérophile, vol. 28, nos. 7 and 8, April 1 and 15, 1920, pp. 108-112, 3 figs. Characteristics of engines.

See also British and French Types.

Passenger. The Airco 18 Aeroplane. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 238-240, 27 figs. partly on supp. plate. Designed by Aircraft Manufacturing Co., Ltd., Hendon, England, for passenger and goods carrying service operated by Aircraft Transport and Travel, Ltd., between London and Paris and London and Amsterdam. Machine is capable of carrying 8 passengers in addition to pilot and from 200 lb. to 500 lb. of baggage. It is fitted with 450-hp. Napier engine which gives 500 hp. at 2200 r.p.m. and drives 2-bladed propeller through gearing at 1400 r.p.m.

Performance. Aeroplane Performance, David Yelnik. Aerial Age, vol. 10, no. 20, Mar. 1, 1920, pp. 726-727, 2 figs.; also in Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 10-11, 1 fig. Charts based on theoretical considerations of relationship between W/Hp., loading, head resistance, speed and ceiling of aeroplane, principle being similar to Eiffel's polar logarithmic diagram.

An Empirical-Theoretical Method of Comparative Prediction of Airplane Performance. Air Service Information Circular, vol. 1, no. 68, June 4, 1920, 9 pp., 3 figs. Chart giving variation of maximum velocity at any altitude, and absolute ceiling.

Estimating Performance of an Airplane, V. E. Clark. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 349-350, 1 fig. Given engine, flight duration and military or commercial load.

Performance Calculations of an Aeroplane, Frederick J. Grose. Aeronautics, vol. 18, no. 338, April 8, 1920, pp. 290-294, 12 figs. Theory is illustrated in case of aeroplane weighing 2880 lb. fitted with motor of 200 hp. rotating at 1400 r.p.m., and propeller of 9 ft. in diameter.

Performance of an Airplane Fitted with Supercharged Motor (Etude des performances d'un avion muni d'un moteur suralimenté). A. Toussaint. Aéronautique, vol. 1, no. 5, Oct. 1919, pp. 188-196, 4 figs. Graph for determining performances to be expected with various loads and different wing areas. Curves are calculated for type Bregnet 14 A 2 Ren. 300 hp.

See also Slip-Stream Corrections.

Performance with Supercharged Engine. Aeroplane Performance as Influenced by the Use of a Supercharged Engine, George de Bothezat. Aeronautics, vol. 18, no. 349, June 24, 1920, pp. 481-482, 1 fig. Advantages of supercharging are pointed out by computing characteristics of performance in two assumed cases. Technical Notes of United States National Advisory Committee for Aeronautics.

"Pioneer." The "Pioneer" Single-Seater Sportplane. Flight, vol. 12, no. 38, Sept. 16, 1920, pp. 998-1000, 6 figs. Characteristics: Span, 24 ft.; overall length, 14 ft. 6 in.; overall height, 6 ft. 9 in.; area of main planes, 166 sq. ft.; weight, fully loaded, 800 lb.; speed range, 25-70 m.p.h.; engine, 40 hp.; "Pioneer" 4-cylinder vertical.

Position Finding. See RADIOTELEGRAPHY, Position Finding in Aeroplanes.

Profile for Given Lift. Theory of the Lift of Supporting Planes (Zur Theorie des Tragflächenauftriebes), R. v. Mises. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, nos. 5 and 6, Mar. 15 and 31, 1920, pp. 68-73 and 87-89, 14 figs. Writer seeks to find suitable profile forms for given lift conditions. Notes on size and position of lifting force, parameter of profile, and the Joukowski form of profile. It is concluded that the reduction of camber as well as increase of thickness and of edge angle have a favorable effect on movement of pressure center. Examples of profilts with pressure centers are given.

Propeller Selection. See Design.

Propellers. See AEROPLANE PROPELLERS.

Propulsion, New System. A New System of Propulsion. Aeronautics, vol. 18, no. 331, Feb. 19, 1920, p. 157, 2 figs. Principle of using reaction of gas driven into atmosphere by blast engine is said to have been successfully applied by M. Mëlot, who, it is claimed, has invented machine giving 30 hp. for relative speed of 50 m. per sec., with thrust of 45 kg.

Pursuit. See Gourdon-Lesseure Pursuit.

Racing Statistics. Aeroplanes Safer Than Automobiles, Glenn L. Martin. Aeronautics, vol. 17, no. 318, Nov. 20, 1919, pp. 476-477. Statistics of recent aeroplane races compared with similar statistics for automobile races. Figure of 4000 machine-miles per death for automobile contrasted with 17,940 machine-miles per death for aeroplane.

Radiators. See AEROPLANE ENGINES, Radiators.

Radio Communication. Reception Control Experiments on Aeroplanes (Ueber Richtempfangsversuche im Flugzeug), Eberhard Buchwald and Rudolf Haase. Jahrbuch Zeitschrift für drahtlose Telegraphie u. Telephonie, vol. 15, no. 2, Feb. 1920, pp. 101-113, 9 figs. Methods developed for flow measurements were adapted for the receiving conditions of an aeroplane, with the result that it became possible under the most unfavorable circumstances to carry out quantitative reception measurements of an objective nature on aeroplane. Results of investigations carried out during 1917 and 1918 on Döberitz and the Lärz aviation fields.

Radio Equipment. See RADIOTELEGRAPHY, Aeronautical Sets.

Radiotelephony on. See RADIOTELEPHONY, Aeroplanes.

Ranges and Useful Loads. A Study of Airplane Ranges and Useful Loads, J. G. Coffin. Nat. Advisory Committee for Aeronautics, no. 69, 1920, 29 pp., 11 figs. Relation between useful load and range is worked out by two methods, one involving usual performance estimate, the other based upon theoretical considerations. Among results obtained are the following: Machine should fly at constant angle of attack angle corresponding to minimum value of (weight) / (total resistance); it is immaterial whether machine flies high or low as far as range is concerned; resistance is proportional to weight at given altitude; and times of flight at same level for flying at best range speed and at minimum power speed are practically the same.

Reconnaissance. Comparative Averages of Characteristics for Several Pursuit and Reconnaissance Airplanes, Randolph Hall. Aviation, vol. 7, no. 7, Nov. 1, 1919, pp. 298-300, 8 figs. Based on actual performances and measurements taken from planes operated by U. S. Air Service in France.

Rib Construction. Tests with a Special Rib Construction (Versuche mit einer besonderen Holmkonstruktion), Karl Balaban. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 6, Mar. 31, 1920, pp. 81-84, 8 figs. Describes a tongued-and-grooved joint used and gives results of experiments with ribs so constructed.

Riveting Small Tubes. Riveting of Small Tubes (Nietungen an engen Rohren), H. Theobald. Luftfahrt, vol. 24, no. 7, July 1920, pp. 103-104, 18 figs. Also translation in Flight, vol. 12, no. 40, Sept. 30, 1920, pp. 1045-1046, 18 figs. Details of a number of tools recently manufactured by the Schütte-Lanz Airship Construction Co. in Mannheim Fheinau for inserting and securing rivets in small tubes from the inside.

Rudder Moment. Rudder Moment Measurements on an Aeroplane in Flight (Ruder-Moment-Messungen an einem fliegenden Flugzeug), V. Heidelberg. Zeitschrift für Flugtechnik u. Motor Luftschiffahrt, vol. 10, nos. 21 and 22, Nov. 15 and 29, 1919, pp. 236-241 and 249-255, 22 figs. Accounts of experiments with airplanes in flight to determine effect of rudder and influence of its movements on the trim of the machine and on the balancing of moments. Results of experiments are presented with aid of tables and charts.

Sablatnig. The Sablatnig Traffic Aeroplane (Das Sablatnig-Verkehrsflugzeug), Werner v. Langsdorff. Motorwagen, vol. 23, no. 18, June 30, 1920, pp. 326-327, 3 figs. Details of aerial limousine, carrying four passengers besides pilot and observer, designed by Sablatnig and employed for aerial traffic between Berlin-Warnemünde-Copenhagen. Specifications: Engine, 200 hp., 6-cyl. Benz; construction, mainly wood; weight empty, 1335 kg. load, 770 kg.; fuel consumption, 75 liters gasoline per hr.; speed, 120 to 140 km. per hr.

Safety Carriage. The Carriage of a Flying Machine (Das Flugzeug-Fahrgestell), Fritz Schmidt. Dingler's polytechnisches Jl., vol. 334, no. 16, Aug. 9, 1919, pp. 175-178, 7 figs. Writer points out necessity of a serviceable safety carriage for further technical development of aerial traffic and describes in particular the "Gurth-Dr. Sprenger" system of safety carriage which is said to be based on use of brake fluid (oil or glycerine) in connection with air pressure, by which motion of machine, especially when rolling over rough surfaces, is almost eliminated.

Savoia. See Paris Show.

Seaplanes. See SEAPLANES.

Slip-Stream Corrections. Slip-Stream Corrections in Performance Computation, Edward P. Warner. Nat. Advisory Committee for Aeronautics, no. 71, 1920, 12 pp. 2 figs. Values for slipstream correction in computing performance of airplane are determined (1) from wind-tunnel tests of propeller models and (2) from theory by determining mean slip-stream velocity from energy considerations. From method (1) it is found that slip stream should be taken as having 0.9 diameter of propeller and that velocity over stream so defined should be assumed to be constant. Values found by method (2) agree closely with those determined by experiments.

Slow-Speed. The Slow-Speed Airplane, F. H. Norton. Aviation, vol. 9, no. 3, Sept. 1, 1920, pp. 80-82, 8 figs. Accounts of model experiments conducted in order to determine amount of lift and deflection of slipstream for machine having large portion of wings in slipstream of tractor screws and using trailing-edge flaps to deflect air downward.

Soaring Flight. On Soaring-Flight and the Low-Powered Aeroplane. Aeronautics, vol. 18, no. 337, April 1, 1920, pp. 280-282. Statements are quoted from book of Animal Flight by Dr. Hankin in regard to conditions under which

soaring flight of birds takes place. It is concluded from examination of these conditions that power of sustentation is derived from currents of rising air.

Sopwith. Some Post-War Sopwith Machines. Flight, vol. 11, no. 52, Dec. 25, 1919, pp. 1655-1656, 4 figs. Three-seater limousine, 200-hp., sporting two-seater, transport passenger and racing seaplanes.

Sopwith Commercial and Sporting Types. Aerial Age, vol. 11, no. 7, April 26, 1920, pp. 219-220 and p. 232, 3 figs. General description of "Dove," "Gnu," "Grasshopper" and "Wallaby."

Spars, Vibration of. The Vibration of Spars in Aircraft, A. H. Stuart. Engineering, vol. 109, no. 2824, Feb. 13, 1920, p. 201, 9 figs.; also in Aviation, vol. 8, no. 7, May 1, 1920, pp. 290-291, 9 figs. Results of experiments conducted to determine cause of vibrations in lower plane of aeroplane at high engine speed.

Specifications, U. S. Air Service. Specification for Gasoline Level Gages, no. 27,009-C, Feb. 10, 1920; Specification for Aircraft Name Plates, no. 40,017, June 1, 1920; Specification for Airplane Parachutes and Parachute Equipment, no. 40,009-B, June 20, 1920; Specification for Application of Fabric to Aerofoil Surfaces, no. 24,108-C, Jan. 25, 1920; Specification for Bakelized Fabric Propellers, no. 29,514, Apr. 1, 1920; Specification for Reverse Current Relays, no. 27,105, Feb. 15, 1920; Specification for Silk Thread for Use in Airplane Construction, no. 16,015-A, May 10, 1920; Specification for Standard Valves for Oxygen Supply Tanks, no. 27,082-A, May 1, 1920; Specification for Elastic Cord for Shock Absorbers, no. 26,501-E, Apr. 20, 1920; Specification for Waterproof Fabric Covers for Airplane Engines, Cockpits and Propellers, no. 26,751-A, Jan. 20, 1920; Specification for Air and Gasoline Pressure Gages, no. 27,080-A, Dec. 16, 1919; Specification for Power and Lighting Cables for Airplanes, no. 27,074-A, Mar. 10, 1920; Specification for High Manganese Steel Spring Wire, no. 10,292, May 20, 1920; Specification for Airplane Enamels, no. 14,028, Dec. 15, 1919.

Speed at High Altitudes. Factors Involved in High Airplane Speed at Great Altitudes, H. C. Richardson. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 203-207, 7 figs. Study based on fundamental equations of flight and propeller data contained in reports of Nat. Advisory Committee for Aeronautics. It is concluded that under best conditions and assuming that data available could be proportionally reproduced at high altitudes, aeroplane could be designed to give speed of 260 m.p.h. at about 50,000 ft. altitude.

Speed, Measurement of. Note on Measurement of Speed of Airplanes, J. G. Coffin. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 54-55, 6 figs. Graphical method for computation and interpretation of results obtained in trials.

Sport. See Loughead.

Sporting. Small Sporting Aeroplanes. Flight, vol. 12, no. 20, May 13, 1920, pp. 519-523, 28 figs. List of sporting aeroplanes of 50 hp. and under. Sketches are included illustrating the different types. From technical memo issued by Controller of Information of Department of Civil Aviation.

See also Austrian W.K.F.; Cato; Hild-Marshonet; Loughead; "Pioneer"; Sopwith.

Stability. Notes on Longitudinal Stability and Balance, E. P. Warner. Aeronautics, vol. 18, no. 349, June 24, 1920, pp. 485-487, 5 figs. Tests made on five aeroplanes—JN4H, DH4, VE7, USAC-11 and Martin Transport. Conclusions arrived at are that tail surfaces should be of large aspect ratio, that stabilizer should be larger than elevator, that tail should be cambered both above and below, that center of gravity should be from 28 to 30 per cent back of mean chord, and that thrust line should be as high as it can be conveniently placed. Technical Notes of United States National Advisory Committee for Aeronautics.

Stability and Balance in Airplanes, D. R. Husted. Aviation, vol. 8, no. 5, Apr. 1, 1920, pp. 193-194, 4 figs. Practice of measuring dynamic stability of a machine in laboratories of Curtiss Engineering Corp. at Garden City, L. I. It is assumed that when model test gives pitching moment-angle of incidence curve having negative slope of proper magnitude, actual machine will have sufficient pitching stability.

Stalling. The Dangers and Effect of Construction on Stalling (Der uberzogene Flug, seine Gefahren und seine Beeinflussung durch die Konstruktion), H. Hopf. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 4, Feb. 28, 1920, pp. 52-54, 4 figs. Construction of plane is said to affect stalling in two ways: (1) An aeroplane becomes more readily stalled as difference becomes less between its usual speed and speed at which equilibrium of vertical force is no longer possible; (2) aeroplane comes more readily out of stalling as turning in space becomes easier and the more it is possible to check turning of flight path.

Static Head Turn Indicator. The Static Head Turn Indicator for Aeroplanes, Horace Darwin. Aeronautical Jl., vol. 23, no. 108, Dec. 1919, pp. 617-625, 4 figs. Ogilvie pressure gage adapted for indicating minute differences of pressures caused by aeroplane turning.

Static Testing. Present Procedure in Static Testing of Airplane, Engineering Division U. S. Air Service. Air Service Information Circular, vol. 1, no. 10, March 25, 1920, 15 pp., 12 figs.

Strength. Note on an Empirical Formula for Aeroplane Strength, A. J. Sutton Pippard. Aeronautical Jl., vol. 24, no. 112, April 1920, pp. 204-205. Formula for load factor in terms of horsepower per 1000 lb. gross weight of aeroplane and overall length of aeroplane in feet. Table is given showing load factor for various types of aeroplanes both as computed from this formula and as actually determined.

Stresses. Experimental Equations for Continuous Beams. Eng. Division Air Service, Dayton, O., Technical Orders No. 7, Apr. 1919, pp. 43-53, 13 figs. Conditions of loading which are ordinarily used in stress analysis of airplanes and which require theorem of three moments for solution of moments, shears and reactions, and theory of elastic curve for determination of deflections.

See also Loads and Stresses.

Struts. Calculation of Strength of Aerodynamically Important Transectional Forms (Festigkeitsberechnung aerodynamisch wichtiger Querschnittsformen), Otto Steinitz. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 11 and 12, June 28, 1919, pp. 127-131, 39 figs. Formulæ.

Effect of Struts and Wires on the Speed of an Aeroplane (Einwirkung von Stielen und Kabeln auf die Geschwindigkeit eines Flugzeuges), V. Heidelberg. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 10, no. 20, Oct. 30, 1919, pp. 221-224, 6 figs. Measurements on a Fokker D VII with and without struts and wires are said to have shown that a strutted machine attains in horizontal flight only slightly more speed than the regular machine, but that its rate of climb is materially improved by the absence of struts.

Effect of Surface Quality of Struts on Aeroplane Resistance (Der Einfluss der Oberflächenbeschaffenheit auf den Widerstand, untersucht an Streben), C. Wieselsberger. Zeitschrift für

Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 4, Feb. 28, 1920, pp. 54-57, 8 figs. Curves are given showing results of tests on thick struts covered with linen and with a single coat of varnish. Third report from the Göttingen Model Experimental Station for Aerodynamics.

Investigation of the Compressive Strength of Spruce Struts of Rectangular Cross Section and the Derivation of Formulas Suitable for Use in Airplane Design, James E. Boyd. Technologic Papers Bur. Standards, no. 152, April 19, 1920, 43 pp., 14 figs. It is concluded from experiments that Euler's formula gives accurate results in design of round-end spruce struts for values of L/r greater than 100 and may be used with little error for values between 80 and 100. Modification of Euler's formula for ultimate strength for round-end spruce struts, which corresponds to modulus of elasticity of 1,622,000 lb. per sq. in. is recommended, and also similar modifications of Rankine formula for short round-end spruce struts and for square-end struts.

Location of Interplane Struts, A. S. Niles and B. C. Boulton. (Eng. Division Air Service, Technical Orders, no. 14, Mar. 1920, pp. 61-77, 11 figs.; also in Aerial Age, vol. 12, no. 3, Sept. 27, 1920, pp. 75-79 and 82, 11 figs. Experimental investigation of most economical location for struts of different types of aeroplanes, and to learn effect of different variables in changing this location. Types of aeroplanes investigated were monoplane, single-bay and two-bay biplane, and three-bay biplane.

Resistance of Navy No. 1 Struts, A. F. Zahm. Aerial Age, vol. 10, no. 11, Dec. 29, 1919, pp. 407-408, 4 figs. Aviation, vol. 7, no. 6, Oct. 15, 1919, pp. 256-257, 4 figs. Results of tests. Experimental investigation by Bureau of Construction and Repair is said to have established that Navy No. 1 strut has smaller coefficient of resistance than any hitherto reported.

Resistance of Six Different Strut Forms for Streamline Fairing of Cables and Tubes. Eng. Division Air Service (Dayton, O.). Technical Orders no. 8, Sept. 1919, pp. 39-50, 7 figs. Results of tests.

Technical Orders. Eng. Division, Air Service, Dayton, Ohio, no. 7, Apr. 1919, 91 pp., 12 figs. Including non-injurious tests for determining ultimate strength of interplane struts for airplanes.

The Efficiency of Airplane Struts, Wallace F. Wiley. Aviation, vol. 8, no. 12, July 15, 1920, pp. 477-478, 3 figs. General equation for power absorbed by a strut of any material, section, length and strength at any velocity. Application of equation exemplified.

The Strength of Tubular Struts, Andrew Robertson. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, p. 281. Formula for callapsing load per sq. in.

The Use of the Hollow Strut on the New Airplanes, Edward P. Warner. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 716-720, 20 figs. Analytical determination of possible saving in weight as compared with solid struts.

Two Non-Injurious Tests for Determining Ultimate Strength of Interplane Struts for Airplanes. Eng. Division Air Service, Dayton, O., Technical Orders No. 7, Apr. 1919, pp. 53-69, 9 figs. First method consists in loading strut gradually in non-follow-up-load-testing machine until maximum load is reached and ascertained. Second method consists in making simple bending test of strut for certain data which are used to calculate ultimate strength of strut.

See also Loads and Stresses.

Supporting-Plane Ribs. The Calculation of Supporting-Plane Ribs (Zur Berechnung von Tragflächenholmen), A. Pröll. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 13, July 15, 1920, pp. 190-193. Writer believes, in conformity with Müller-Breslau, that it is desirable to greatly limit the sphere of validity of his abridged approximation formula propounded in previous issues of same journal.

Testing. Official Airplane Report Form. Air Service Information Circular, vol. 1, no. 97, Sept. 15, 1920, 7 pp., 1 fig. Blank form for reporting characteristics of machine and results obtained in tests.

Tests. Aeromarine Model 40 Hull Test. Aviation, vol. 9, no. 4, Sept. 15, 1920, pp. 115-118. 7 figs. Results of tests made at Aeromarine Plane & Motor Co.'s factory, Keyport, N. J., to determine flying, diving and landing conditions.

Résumé of McCook Field Test Reports. Eng. Division Air Service, Dayton, Ohio, Technical Orders no. 7, Apr. 1919, pp. 82-91. Account of static tests, tests of torque equalizing wing, resistance tests, tests of Smith parachute, etc.

Résumé of McCook Field Test Reports. Eng. Division Air Service (Dayton, O.), Technical Orders no. 8, Sept. 1919, pp. 59-79. Reports of airplane section.

Timber Splices. An Investigation into Various Types of Timber Splices for Aeroplane Construction, G. W. C. Kaye and J. Hudson Davies. Aeronautical Jl., vol. 24, no. 117, Sept. 1920, pp. 517-525, 26 figs. Tests conducted by Aeronautical Inspection Department, Royal Air Force. "Straight" splices with contact face, either flat or alternatively serrated and meshed are recommended as best form of scarf for splicing timber which is to be subjected to bending movement.

Torpedoplanes. German Torpedoplanes (Deutsche Torpedoflugzeuge), Werner v. Langsdorff. Schiffbau, vol. 21, no. 32, June 30, 1920, pp. 873-874. Account of types used successfully during war, designed by K. Roesner of the Gotha car shops, developed from the double-engine giant aeroplane Gotha, which is also constructed as a seaplane. Also used as observation planes and for transportation of troops in rapid occupation of small islands, etc.

New American Torpedo Plane. Aeronautics, vol. 18, no. 347, June 10, 1920, pp. 444-445, 6 figs. Specifications: Wing spread, over all, 71 ft. 5 in.; spread, wings folder, 35 ft. 10 in.; length, overall, 46 ft. 4 in.; height, overall, 14 ft.; weight, empty, 6533 lb.; weight, gross, 11,487 lb.; maximum speed, 107 m.p.h.; economical speed (at sea level), 95 m.p.h.; climbing speed (from sea level), 5100 ft. in 10 min.; cruising radius, 480 m.p.h.; service ceiling, 12,000 ft.

New Glenn L. Martin Navy Torpedo Plane. Aviation, vol. 8, no. 9, June 1, 1920, pp. 359-360, 5 figs. Characteristics: Wing span, overall, 71 ft. 5 in.; length, overall, 46 ft. 4 in.; height, overall, 14 ft.; weight, gross, 11,487 lbs.; economical speed at sea level, 95 m.p.h.; service ceiling, 10,000 ft.; absolute ceiling, 12,000 ft.; motors, two 12-cyl. Liberty motors, each 400 hp., rated at 1700 r.p.m. with self-starters.

Traction Requirements. Traction Requirements of Flying Machines (Der Zugkraftbedarf von Flugzeugen), Georg Konig. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 13 and 14, July 26, 1919, pp. 137-150, 24 figs. Study of elementary traction curve and results of tests are given. Beneficial and harmful effects of constructive changes are pointed out, as well as methods and instruments required for measurements during flight.

Transoceanic Service. The Possibilities of Development in the Construction of Aeroplanes and Dirigibles for Transoceanic Service (Ueber die Entwicklungsmöglichkeiten im Bau von Riesenflugzeugen und ozeantüchtigen Flugschiffen), F. Ernst Bielefeld. Motorwagen, vol. 22, no. 35, Dec. 20, 1919, pp. 680-685, 24 figs. Discussion of supporting plane section, load per square meter of supporting plane and construction in fabricated materials and metals of giant aeroplanes and ocean dirigibles, which writer predicts will be most generally employed in the future.

Transport. See Ansaldo Transport; Eagle; Farman Goliath.

Undercarriages. See AIRCRAFT, Undercarriages.

U. S. Navy. See Amphibian; Torpedoplanes.

Use in Future Wars. The Effect of Air Service on the Tactics of Coast Defense, James Prentice. Jl. U. S. Artillery, vol. 52, no. 2, Feb. 1920, pp. 97-106. Uses of airships and aeroplanes in future wars are pointed out.

Variable-Angle. The Variable Angle of Incidence Airplane. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 541-542, 3 figs. Considered from points of view of aerodynamical efficiency, longitudinal stability and controllability, structural reliability, and landing possibilities. Future of variable angle machine appears very doubtful because it is seen that "there is no aerodynamic gain and possibly slight loss, complication, added weight and no compensating advantages."

Vickers Commercial. "Atlantic" Type Vickers Converted for Commercial Use. Aerial Age, vol. 10, no. 16, Feb. 2, 1920, pp. 600-601, 2 figs. Specifications: Overall length, 42 ft. 8 in.; overall height, 15 ft. 3 in.; span, 67 ft.; weight per sq. ft., 8.75 lb.

VE-7 Training. The VE-7 Training Aeroplane. Aerial Age, vol. 12, no. 4, Oct. 4, 1920, pp. 110 and 114, 5 figs. Machine designed as advanced training aeroplane to be put into quantity production as standard type for U. S. Army Air Service. Dimensions: Length overall, 24 ft. 2 in.; height overall, 8 ft. 7½ in.; span, both planes, 34 ft. 3 in.; engine is Hispano-Suiza, 8-cylinder, 150-hp., water-cooled type.

Weights of Various Types. Structural Weight Analysis of Airplanes. Air Service Information Circular, vol. 1, no. 39, May 8, 1920, 4 pp., 1 fig. Tabulation of weights for several types.

Westland. The Westland 6-Seater. Aeronautics, vol. 19, no. 356, Aug. 12, 1920, pp. 128-129, 8 figs. Data: Weight, fully loaded, 5550 lb.; overall length, 33 ft. 6 in.; overall height, 12 ft. 6 in.; span, 54 ft.; engine, 450 b.hp. Napier Lion.

Wind Tunnels. See WIND TUNNELS.

Wing Area. Variable Wing Area and Variable Camber, H. B. Irving. Aviation, vol. 9, no. 1, Aug. 1, 1920, pp. 19-21, 4 figs. Discussion of methods of improving airplane performance.

Wing Beams. The Graphical Method for the Deflection of Beams of Non-Uniform Section, B. C. Boulton, H. M. Priest. Aerial Age, vol. 11, no. 1, Mar. 15, 1920, pp. 17-19, 7 figs. Method is developed on principle that deflection curve of wing beams of aeroplane can be obtained from loading curve by four successive integrations or from moment curve by two successive integrations. Integrations are performed graphically.

The Strength of One-Piece Solid, Built-Up and Laminated Wood Aeroplane Wing Beams, John H. Nelson. Nat. Advisory Committee for Aeronautics, no. 35, 1919, 12 pp., 12 figs.; also in Aerial Age, vol. 10, no. 18, Feb. 16, 1920, pp. 661-663 and 673, 5 figs. Tests conducted at Bureau of Standards to determine suitability of common wood as substitute for spruce.

Wing Coverings. See AIRCRAFT CONSTRUCTION MATERIALS, Wing Coverings.

Wing Design. Theories of Wing Design. Aeronautics, vol. 18, no. 332, Feb. 26, 1920, p. 185, 3 figs. Measurements taken by means of borings are said to have supported theory that efficiency of wing is due to rarefaction of air and consequent suction action on upper surface of wing.

Wing-Efficiency in Aeroplanes. Times Eng. Supp., vol. 16, no. 551, Sept. 1920, p. 276. Lines of experimental development.

Wing-Fabric Fastenings. Fabric Fastenings, E. D. Whalen and R. T. Fisher. Aerial Age, vol. 11, no. 14, June 14, 1920, pp. 474-475. It is concluded from tests that (1) unwaxed cotton cords are materially better resistors of abrasion fray than unwaxed linen, (2) waxen linen and cotton have practically the same resistance to abrasion fray, and (3) waxed or unwaxed cotton cords are materially better than waxed or unwaxed linen as a resistor of tension fray.

Wing Ribs. Development of a 15-Foot Airplane Wing Rib, Raymond M. Wirka. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 386-388, 12 figs. Load-travel curves of plywood web, twisted veneer strap, and Pratt truss types at Forest Products Laboratory of U. S. Forest Service, Madison, Wis., showed that ribs of these types were not quite so stiff as those of other types. Ribs of Warren truss type, design no. 11, were found to be superior in strength per unit weight to all other ribs tested.

Wing Sections. Selection of a Wing Section, Raoul J. Hoffman. Aviation, vol. 7, no 11, Jan. 1, 1920, pp. 491-492, 2 figs. Chart showing R. A. F. 6, R. A. F. 15, and U. S. A. 6 wing sections.

Some Göttingen Tests on Thick Sections. Flight, vol. 12, no. 16, April 15, 1920, pp. 424-425, 8 figs. Tests on wing sections at Göttingen laboratory. Extracts from German Technical Reports.

Wings. A New High Performance Wing. Aviation, vol. 9, no. 4, Sept. 15, 1920, p. 124. Describes new form of airplane wing called Alula, chief characteristics of which are a straight trailing edge, a negative dihedral leading edge, a deep camber, and a wash-out in chord, camber and incidence toward the tip. Specifications are given.

Analysis of Wing Truss Stresses including the Effect of Redundancies, E. P. Warner and R. G. Miller. Nat. Advisory Committee for Aeronautics, report no. 92, 1920, 20 pp., 5 figs. It is concluded from considerations based on experiments and calculations that wooden members may be omitted from consideration in work equations without causing any serious error. Effect of stagger wires is considered unimportant when load is approximately equally distributed between form and rear trusses. It is believed that work now done by two wires could be accomplished equally well by a single one as only very rarely are both wires stressed at one time.

Calculation of Supporting Surface Planes (Zur Berechnung von Tragflächenholmen), H. Müller-Breslau. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, no. 19, Oct. 15, 1919, pp. 197-201, 1 fig. Gives tables and refers to Pröll's defense of his approximation formulæ for calculation of greatest bending moments, calculation of greatest field moments and deflections in connection therewith.

Determination of the Pressure Law for Wing Surfaces, S. E. Slocum. Aerial Age, vol. 11, no. 6, Apr. 19, 1920, pp. 188-189 and 200, 3 figs. Gives result of analysis based on data

from classic work of Eiffel, which, it is pointed out, are not to be regarded as establishing general law, but to serve as example of how variation in wind pressure on an actual wing surface may be studied, and indicate how far results may be expected to deviate from law of square.

Developments in Wing Design, Douglas Shaw. Aeronautics, vol. 19, no. 361, Sept. 16, 1920, pp. 210-211. Form of wing with single continuous high lift upper surface coupled with two tandem lower surfaces said to give longitudinal stability and to have greater efficiency than ordinary type.

Discussion of Stress Analysis of an Airplane Wing Cellule of the Multi-Spar Type of Wing Construction, with Special Reference to the Loading Condition of the Standard Static Test. Air Service Information Circular, vol. 1, no. 52, May 18, 1920, 4 pp., 5 figs. Drift truss and stress diagrams.

Preliminary Choice of a Wing Section, W. F. Gerhardt, B. C. Boulton and L. V. Kerber. Aerial Age, vol. 11, no. 25, Aug. 30, 1920, pp. 839-841 and 849. Analytical tests are suggested for preliminary evaluation of aerofoils best adapted for given conditions of aeroplane design.

Report of Static Test of D.H. 4 (P. 34) Wing Cellule. Air Service Information Circular, Eng. Div., Air Service, vol. 1, no. 36, May 8, 1920, 2 pp., 5 figs. Test showed that with proper maintenance and repair of damage, strength of the wing structure will not be materially reduced by long service.

Similarity Tests of Wing Profiles (Aehnlichkeitsversuche an Flugelprofilen), H. Kumbruch. Zeitschrift für Flugtechnik und Motorluftschiffahrt, vol. 10, nos. 9 and 10, May 31, 1919, pp. 95-109, 18 figs. Five different types of profiles were tested. As a result of tests it is concluded that vertical force coefficient is much less dependent on extent of characteristic value than resistance coefficient. It is pointed out that since the moment coefficient depends mainly on vertical force, it is also practically independent of characteristic value.

The Alula High-Lift Wing. Aerial Age, vol. 11, no. 25, Aug. 30, 1920, pp. 836-838, 3 figs. Data on wing recently developed in England.

The "Alula" Wing. Flight, vol. 12, no. 32, Aug. 5, 1920, pp. 862-863, 2 figs. Wing is characterized by very high maximum lift with maximum **L/D** of about 22.9. Design with such wing and intended for carrying heavy loads at moderate speeds is suggested.

The Case for the Cantilever Wing. Flight, vol. 12, no. 12 and 13, March 18 and 25, 1920, pp. 311-313 and 342-343, 13 figs. Suggested parasol cantilever monoplane.

The Parker Variable Camber Wing, H. F. Parker. Nat. Advisory Committee for Aeronautics, report no. 77, 1920, 41 pp., 25 figs. Wing ceases to deflect after application of its normal maximum load. This is accomplished by means of an internal bracing system which only comes into operation when maximum deflection has been reached.

The Touring Airplane and the Variable Camber Wing, J. D. Hill. Aviation, vol. 9, no. 5, Oct. 1, 1920, pp. 159-160, 1 fig. Suggests design of variable camber airplane.

See also Design; Wing Beams; Wing Design; Wing Ribs.

Wireless Equipment for. See AERONAUTICS, Problems.

Wireless Guiding of. Experiments with Wireless Guiding of Aeroplanes (Versuche über drahtlose Anpeilung von Flugzeugen), Richard Baldus and Eberhard Buchwald. Jahrbuch für drahtlose Telegraphie u. Telephonie, vol. 15, no. 3, Mar. 1920, pp. 214-236, 19 figs. Results of a number of experiments carried out by authors at the Döberitz and Lärz aviation fields during 1917 and 1918.

Wisenant. The Wisenant Longitudinal Aeroplane, M. A. Spicer. Aerial Age, vol. 11, no. 24, Aug. 23, 1920, pp. 804-805, 5 figs. Main panels are placed parallel with fuselage instead of at right angles as in all other heavier-than-air machines. Twin propellers, driven by single engine through shaft drive and small panels attached to lower part of fuselage directly back of propellers, are also novel feature.

Working Equation. The "Working Equation of the Aeroplane" in Scalar Charts (Die "Arbeitsgleichung des Flugzeuges" in skalarer Darstellung), Fritz Gabriel. Motorwagen, vol. 23, no. 13, May 10, 1920, pp. 216-222, 5 figs. Method of scalar presentation is described, special advantage of which is said to be that the influence of a change in experimental constants contained in technical equations can be taken into consideration.

Zeppelins. Giant German Aeroplanes (Les avions géants allemands), G. Crouvezier. Aérophile, vol. 27, nos. 19-20, Oct. 1-15, 1919, pp. 294-295, 2 figs. Notes on Zeppelin type R-4, fitted with five motors and five propellers.

The Zeppelin Giant Sea Monoplane. Aviation, vol. 8, no. 1, Feb. 1, 1920, p. 28, 2 figs. Power plant is composed of four 260-hp. 6-cylinder Mercedes engines, which are disposed in two nacelles arranged between boat hull and fuselage and drive tractor and pusher screws respectively.

[See also AERODROMES; AERONAUTICS; AVIATION.]

AGRICULTURAL TRACTORS

See TRACTORS, FARM.

AIR

Analysis of. The Rapid Determination of Carbon Monoxide in Air, Arthur B. Lamb and Alfred T. Larson. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1908-1921, 5 figs. Two thermometric methods are described.

Characteristic Equation. Characteristic Equation Applicable to Atmospheric Air (Sur une equation caractéristique approprié à l'air atmosphérique. Ed. Foucé. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 24, Dec. 15, 1919, pp. 1158-1160. Coefficients are determined for assumed gas, "aeroid," critical point of which is taken to correspond to: temperature, —137.23 deg. cent.; pressure, 40.1 atmospheres; specific volume, 0.00325.

Flow of. See FLOW OF AIR.

Germ Determination. Biology of Atmospheric Dust—The Aeroplancton (Die Biologie des atmosphärischen Staubes—das Aeroplankton), Franz Matouschek. Rauch und Staub, vol. 9, no. 12, Sept. 1919, pp. 87-89. Two methods are described for determining germs in air—the precipitation and the filtration or aspiration method.

Liquefaction. The Fundamental Physical Principles of the Technology of Liquefaction of Air (Die physikalischen Grundlagen der Technik der Luftverflüssigung), R. Plank. Zeitschrift für die gesamte Kälte-Industrie, vol. 27, no. 1, Jan. 1920, pp. 1-8, 4 figs. Determination of the differential relations between cooling by means of throttling, and the most important thermal quantities, followed by discussion of cooling in connection with reversible adiabatic expansion, a comparison of the two methods, and of the Linde and Claude machines.

Liquid. See LIQUID AIR.

Pressure Variation with Altitude. Experimental Laws of Variations of Barometric Pressure and Specific Weight of Air with Altitude (Lois expérimentales des variations de la pression barométrique et du poids spécifique de l'air avec l'altitude), Rodolphe Soreau. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1023-1025. Based on forty series of observations with sounding balloons executed during first semester of 1912.

Specific Heat at Low Temperature. Specific Heat of Air at Room Temperature and at Low Temperatures (Die spezifische Wärme der Luft bei Zimmertemperatur und bei tiefen Temperaturen), Karl Scheel and Wilhelm Heuse. Zeitschrift für Sauerstoff- und Stickstoff-Industrie, vol. 11, nos. 9 and 10, May 1919, pp. 33-36. Specific heats of air were determined by means of two calorimeters; table is given in which average data of observations are presented.

AIR BRAKES

See BRAKES.

AIR CLEANING

Cottrell Electrical Process. Air Cleaning by the Cottrell Electrical Precipitation Process, P. E. Landolt and H. M. Pier. Jl. Engrs. Club of Phila., vol. 37-5, no. 186, May 1920, pp. 198-206, 2 figs. Paper presented before Eastern Chapter of Am. Soc. of Heat. & Vent. Engrs.

AIR, COMPRESSED

See COMPRESSED AIR.

AIR COMPRESSORS

Electrically Driven. Electrically-Driven Geared Air Compressors. Engr., vol. 129, no. 3343, Jan. 23, 1920, p. 98, 2 figs. Models recently placed on market by Broom and Wade, Ltd., High Wycombe.

Electro-Pneumatic Device for Electrically Driven Air Compressors, Geo. J. Duckett. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 504-505, 3 figs. Suggested automatic arrangement in form of decompressor for releasing cylinder compression on starting up motor allowing normal current to flow and thus saving starter contacts.

Flottmann. A New Piston Compressor (Ein neuer Kolbenkompressor). Braunkohle, vol. 18, no. 43, Jan. 24, 1920, pp. 563-564, 2 figs. Description and illustrations of a compressor designed by the H. Flottmann & Co. machine works which, it is said, possesses the advantages of two-stage single-cylinder compressors, but without certain of their disadvantages.

Low-Pressure. Driving Air Compressors by Exhaust Steam, A. Dessemond. Colliery Guardian, vol. 119, no. 3089, March 12, 1920, pp. 745-746, 3 figs. Description of low-pressure compressor at Villiers Colliery. Translated from Bulletin de la Société de l'Industrie Minérale.

Lubrication of. Lubrication of Air Compressors, H. V. Conrad. Boiler Maker, vol. 20, no. 4, Apr. 1920, pp. 95-97. Satisfactory lubrication of air-compressor cylinders is said to be attained by securing (1) reduction of friction to a minimum and (2) elimination of carbonization of oil as far as possible.

Oil Vapor in. Oil Vapor in Compressors, John Thompson. Iron & Coal Trades Rev., vol. 99, no. 2700, Nov. 28, 1919, pp. 703-704, 2 figs. Instances where gaseous vapor has been generated from lubricating oil. Paper read before South Staffordshire, Warwickshire & Worcestershire Branch of Nat. Assn. of Colliery Managers.

Raising Liquids With. The Influence of Air Conditions on Raising Liquids with Air Compressors (Ueber den Einfluss des Luftzustandes auf die Förderung bei Luft Luftkompressoren), Erich Lampel. Zeitschrift für komprimirte u. flüssige Gase, vol. 20, no. 7, 1919, pp. 73-78, 4 figs. Different air conditions have great influence on volume and weight of aspirated air, air pressure and temperature being main factors in the change, while moisture in air and reëxpansions are of less importance.

Reciprocating. Flywheel Effect for Synchronous Motors Connected to Reciprocating Compressors, R. E. Doherty. Am. Soc. Refrig. Engrs. Jl., vol. 6, no. 3, Nov. 1919, pp. 159-177, 9 figs. Process of obtaining turning effort curve for reciprocating compressor illustrated.

Rotary. A Perfected High-Pressure Rotary Compressor, Chester B. Lord. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 877-878 and 905. Excessive end pressure said to be overcome by floating plates at ends of cylinder held in intimate contact with rotor by pressure generated by machine itself. A volumetric efficiency of 92 per cent is claimed.

Steam-Driven, Tests on. Tests on Small Engines at High Back Pressures, Alan E. Flowers, R. J. Pepper and Crosby Field. Chem. & Metallurgical Eng., vol. 22, no. 7, Feb. 18, 1920, pp. 318-320, 6 figs. Results of tests on steam-driven compressors operating under conditions found in chemical plants. Units varied from 12.3 to 80.5 i.hp. per 100 r.p.m. at full load.

Turbo-Compressors. A New High-Speed Turbo-Compressor, Bandroft Gore. Eng. & Min. Jl., vol. 110, no. 15, Oct. 9, 1920, pp. 717-718, 3 figs. Machines designed for Argentine copper smelter.

Turbo-Compressor Calculations, Allen H. Blaisdell. Mech. Eng., vol. 42, no. 3, March 1920, pp. 151-156, 6 figs. Number of stages to be used in a given case is discussed and method of laying out compression diagram and of subdividing it according to number of stages to be provided for is explained. Expressions are derived for actual and effective impeller radii and axial depth of channel of any radius and graphical method is outlined for calculating theoretical head to be developed by an impeller.

Turbo-Driven. Driving Air Compressors by Exhaust Steam, A. Dessemond. Colliery Guardian, vol. 119, no. 3088, Mar. 5, 1920, pp. 659-660, 3 figs. Rateau system of direct drive from mixed-pressure turbine. Translated from Bul. de la Société de l'Industrie Minérale.

Water Jacketing, Value of. Some Elements of Economy in Air Compression, Wm. Carter. Can. Min. Jl., vol. 40, no. 44, Nov. 5, 1919, pp. 826-829 and 831. Greatest value of water jacketing is seen in its effect on lubrication and resultant wearing qualities of machine.

AIR CONDITIONING

Factories. Automatic Regulation of Humidity in Factories. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 24-28, 6 figs. Conditioning apparatus developed at U. S. Forest Products Laboratory, Madison, Wis.

Humidification and Cooling of Work Shops (L'humidification et le rafraichissement des ateliers), Emile Masson. Revue Universelle des Mines, vol. 2, no. 2, June 1919, pp. 285-323, 10 figs. Comparative study of value of vaporizers, saturators, atomizers and super-saturators. Regulations adopted at Rouen congress are quoted. These established that hygrometric state of work shop should be maintained between 61 to 70 per cent, that the air of factory should be renewed twice each hour and that the inside temperature should be maintained above 15 deg. cent. in winter and below 25 deg. cent. in summer.

Heat Content of Moist Air. Heat Content of Moist Air (Ueber den Wärmeinhalt der feuchten Luft), W. Schule. Zeitschrift des Vereins Deutscher Ingenieure, vol. 63, no. 29, July 19, 1919, pp. 682-684, 3 figs. Reyscher's diagram of heat content of moist air is corrected, amplified and extended to temperatures up to 350 deg.

Industrial Application. Industrial Air Conditioning, J. Esten Bolling. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 11-23, 8 figs. Its industrial applications.

School Buildings. An Advance in Air Conditioning in School Buildings, E. S. Hallett. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 1-10, 2 figs. Design of heating system for school building of St. Louis Board of Education, which provides method of incorporating ozone apparatus.

AIR CRAFT

See AIRCRAFT.

AIR EJECTORS

Theory and Design. Air Ejectors; Theory and Design, E. J. Lashinger. Jl. South African Inst. of Engrs., vol. 18, no. 6, Jan. 1920, pp. 89-91 and (discussion) pp. 91-95, 5 figs. Formulæ for determining proportions of nozzles to throat.

AIR FILTERS

Non-Fabric. Construction of Air Filters without Cotton or Other Fabrics (Stofflose Luftfilter), Ernst Preger. Werkstattstechnik, vol. 14, no. 3, Feb. 1, 1920, pp. 71-73, 16 figs. Types operating according to principle of subjecting the air to a repeated change of direction and thereby causing the dust to settle on walls to which it adheres.

AIR FLOW

See FLOW OF AIR.

AIR FURNACES

See MALLEABLE IRON, Melting.

AIR LIFT

Pumping Acids with. See ACIDS, Pumping.

Pumps. See PUMPS, Air-Lift.

AIR PUMPS

Condensers. See CONDENSERS, STEAM, Air Pumps for.

Radojet. The Radojet Air Pump, M. C. Stuart and Arthur H. Senner. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 437-471, 32 figs., partly on 9 supp. plates. Results of tests made at U. S. Naval Eng. Experiment Station, Annapolis, Md., on two Radojet air pumps manufactured by C. H. Wheeler Manufacturing Co.

The Radojet Air Pump and Its Operation, Henry Wright. Power House, vol. 13, no. 11, June 5, 1920, pp. 254-256, 4 figs. Description of type of high-vacuum apparatus, patented by C. H. Wheeler of Philadelphia, and discussion of a problem arising during its operation.

Schell Hydraulic. The Removal of Air from Pumps and Suction Piping (Ueber Entlüftung von Pumpen und Saugleitungen). Braunkohle, vol. 18, no. 32, Nov. 8, 1919, pp. 420-423, 6 figs. Schell hydraulic air pump, which is said to possess few internal moving parts, and to require no attendance and no lubrication.

Steam-Jet. Steam-Jet Air Pumps for Condensers, DeWitt M. Taylor. Power, vol. 51, no. 25, June 22, 1920, pp. 995-999, 9 figs. Problem of air removal from condensers and various methods of solving it. Description of various makes of steam-jet pumps designed for condenser work. Some points necessary to observe in their installation and operation, with few of their advantages.

AIRCRAFT

Control Surfaces, Balancing of. Balanced Control Surfaces on Aircraft, R. N. Wing. Aviation, vol. 8, no. 2, Feb. 15, 1920, pp. 57-58, 4 figs. Two methods of obtaining balancing effect are explained, (1) by moving pivot points aft to center of pressure about 20 per cent aft leading edge on rectangular surface, and (2) by moving center of pressure forward to pivot or hinge line by extension of part of surface in front of hinge line.

Design. Characteristics of Design Affecting Production Operation, and Maintenance of Aircraft, Percy Bishop. Flight, vol. 12, no. 8, Feb. 19, 1920, pp. 216-219. Paper read before Royal Aeronautical Society.

Helicopters. See HELICOPTERS.

Metal Construction. Metal Construction of Aircraft (Construction métallique de l'avion), Henri Mirgue. Aérophile, vol. 27, nos. 15 and 16 and 17 and 18, Aug. 1-15 and Sept. 1-15, 1919, pp. 226-227 and 270-273, 20 figs. Aug. 1-15: Characteristics of Rudge and Dunlap beams. Sept. 1-15: Particulars of Boulton, Poul and Humber beams.

Naval. See U. S. Navy; NAVAL AIRCRAFT.

Navigation. See RADIO COMMUNICATION, Guiding Aerial and Marine Craft.

Radio Sets. See RADIO COMMUNICATION, Aircraft Radio Sets.

Radio Signaling. The Elimination of Magneto Disturbance in the Reception of Wireless Signals on Aircraft, James Robinson. Radio Rev., vol. 1, no. 3, Dec. 1919, pp. 105-110, 2 figs. Laboratory experiments are said to have established that cause of magneto disturbance is emission of very short waves by magneto system.

Radiotelephony in. See RADIOTELEPHONY, Aircraft.

Undercarriages. Aircraft Undercarriages, John D. North. Aeronautics, vol. 17, no. 321, Dec. 11, 1919, pp. 528-529; vol. 18, nos. 325, 326 and 327, Jan. 8, 15 and 22, 1920, pp. 44-47, 60-63 and 83-88, 36 figs. Also in Aeronautical Jl., vol. 24, no. 110, Feb. 1920, pp. 39-73 and (discussion) 73-84, 39 figs. and Flight, vol. 11, no. 50, Dec. 11, 1919, pp. 1596-1599, 7 figs. and vol. 12, no. 6, Feb. 5, 1920, pp. 161-163, 2 figs. Account of the development of undercarriages and a study of stresses developed in undercarriage during landing with notes on proper design of undercarriage to diminish these stresses.

U. S. Navy. U. S. Naval Aircraft, Jerome C. Hunsaker. Jl. Franklin Inst., vol. 189, no. 6, June 1920, pp. 715-736, 12 figs. Types used.

Uses in Forestry. The Use of Aircraft in Forestry, Ellwood Wilson. Am. Forestry, vol. 26, no. 318, June 1920, pp. 326-328, 4 figs. Method of making contour map of area covered by pictures taken from an airplane is illustrated.

[See also AERODROMES; AERONAUTICS; AEROPLANES; AIRSHIPS; AVIATION; BALLOONS; FLYING BOATS; HELICOPTERS; NAVAL AIRCRAFT; SEAPLANES.]

AIRCRAFT CONSTRUCTION MATERIALS

Aeroplane Woods. Supplies and Production of Aircraft Woods. Nat. Advisory Committee for Aeronautics, report no. 67, 1920, 62 pp., 23 figs. Compilation of available information regarding supplies of kinds of wood that have

been used or seem likely to become important in construction of airplanes and amount of lumber of each species normally put on the market each year; uses to which each kind of wood is or may be put.

The Care of Aeroplane Wood, F. J. Hallauer. Aerial Age, vol. 10, no. 8, Nov. 24 and Dec. 1, 1919, pp. 289-290. Precautions necessary in storing and shipping of aeroplane stock.

The Effect of Kiln Drying on the Strength of Airplane Woods. Nat. Advisory Committee for Aeronautics, report no. 68, 1920, 69 pp., 22 figs. Conclusions formulated from tests including 26 species, approximately 100 kiln runs and over 100,000 mechanical tests are that wood may have its strength properties, particularly toughness or resistance to shock, quite seriously damaged without any visible evidence of such damage, and that proper kiln drying produces material fully equal in all strength properties to that resulting from air drying under most favorable conditions.

Brazed Fittings. The Heat-Treating of Brazed Fittings for Aircraft, Archibald Black. Jl. Soc. Automotive Engrs., vol. 6, no. 3, Mar. 1920, pp. 174-176. Reference is made to experiments performed at Naval Aircraft Factory which are said to have established that brazed joints can be successfully heat-treated. Method for heat-treating is indicated and rules are formulated to avoid destruction of brazed joint during treatment.

Dopes. Airplane Dopes and Doping, W. H. Smith. Sci. Am. Supp., vol. 88, no. 2292, Dec. 27, 1919, pp. 387 and 390; also in Aerial Age, vol. 10, no. 6, Oct. 27 and Nov. 3, 1919, pp. 208 and 213. Method of shrinking and waterproofing fabric of aeroplane wings. From fourth annual report of Nat. Advisory Committee for Aeronautics.

General Descriptive Matter on Dopes and Instructions for the Application of Dope and Pigmented Protective Coverings. Air Service Information Circular, vol. 1, no. 44, July 30, 1920, 5 pp.

Fabric Coverings. Experiments with Varnishing of Fabric Coverings for Aeroplanes (Versuche mit getränkten Stoffbespannungen), A. Pröll. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, nos. 1 and 2, Jan. 15 and 31, 1920, pp. 1-6 and 17-23, 25 figs. Results of experiments are said to show that the most important points to be considered are strength of material to be impregnated, flexibility and toughness of varnish coating, change in form of impregnated material and its tensile strength, permeability for air and water, recuperative strength, and durability and weight.

Simplified Curves for Fabric Coverings of Aeroplanes (Vereinfachte Kennlinien für Flügelbespannsstoffe), E. Everling. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 2, Jan. 31, 1920, pp. 23-25, 2 figs. For measurements of stretching of fabric under different stresses, in place of standard characteristics of Haas, a symmetrical method with use of curves is recommended. Special mention is made of Pröll's investigations published in previous issues of same journal. Report from German Experimental Aerial Station.

Fabrics. Fabric and Dope, with Special Reference to Deterioration of Strength and Tautness, F. W. Aston. Aerial Age, vol. 12, no. 2, Sept. 20, 1920, pp. 50-51. Experimental investigation of action of light and material ratings strength of doped and undoped linen aeroplane fabric.

General Descriptive Matter on Airplane Fabrics, Tapes and Cords, and Instructions for the Application of Fabric to the Wings. Air Service Information Circular, vol. 1, no. 45, July 30, 1920, 6 pp.

New Rubberized Airship Fabrics. India Rubber World, vol. 63, no. 1, Oct. 1, 1920, p. 25. Specifications prepared by Manufacturers Aircraft Association.

On the Permeability of Thin Fabrics and Films to Hydrogen and Helium, J. C. McLennan and W. W. Shaver. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 40, no. 237, Sept. 1920, pp. 272-280. Rate of diffusion of hydrogen through series of balloon fabrics was determined experimentally. Permeability of soap films whose thickness corresponds to red-green stage was found for helium to be 670 liters per square meter per day and for hydrogen 960 liters per square meter per day at 20 deg. cent. Diffusion of hydrogen through water films filling interstices of wet cotton fabric was found to be very low; with soap films showing interference colors, rate of diffusion of both hydrogen and helium was considerable.

Permeability of Rubberized Balloon Materials (Die Gasdurchlässigkeit von gummierten Ballonstoffen), Walter Frenzel. Chemiker Zeitung, vol. 43, no. 100, Aug. 19, 1919, pp. 530-532, 6 figs. Account of testing various balloon materials as to their permeability and its dependence of pressure and temperature by means of an interferometer.

Remarks on A. Pröll's Investigations of Aeroplane-Wing Fabric Coverings (Bemerkungen zu den Untersuchungen von A. Pröll über Tragflächenbespannung), Viktor Lewe. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 13, July 15, 1920, pp. 191-192. Writer suggests a formula for determining influence of fabric covering on wing deflections which, he claims, is as good as Pröll's complicated calculation, published in previous issues of same journal. A brief reply from Pröll is appended.

The Fireproofing of Sacking, Tent Linen and Balloon Materials (Die Imprägnierung von Sackstoffen, Zeltleinen und Ballonstoffen gegen Feuer), Willy Hacker. Kunstoffe, vol. 10, no. 6, Mar. 2, 1920, pp. 61-64. Also in Feuerwehrtechnische Zeitschrift, vol. 8, no. 13-14, July 5-20, 1920, pp. 109-112. Most effective media for rendering textures fireproof are said to be ammonium sulphate and ammonium phosphate. Describes various foreign and domestic patents.

The Fire Proofing and Sun Proofing of Airship Fabric, Guy Barr. India-Rubber Jl., vol. 59, no. 21, May 22, 1920, pp. 19-22. Studies in liability to ignition and deterioration under ultra-violet rays in tropics of balloon fabrics, from technical report of Advisory Committee for Aeronautics for 1914-15.

The Liability of Ignition of Balloon Fabrics, Guy Barr. Aviation, vol. 8, no. 11, July 1, 1920, pp. 435-436. Describes tests undertaken to ascertain (1) whether fabric B. 29, a fabric of treble cotton and rubber and doped on exterior with aluminum dust suspended in "soluble gun-cotton," is liable to become ignited owing to gunfire and result of a smouldering wad falling on it; (2) best fire-proofing material to employ to prevent fabric becoming ignited, and effect of this material on strength and permeability of fabrics, both when new and after weathering.

Tropical Exposure of Airship Fabric, Guy Barr. Aviation, vol. 9, no. 1, Aug. 1, 1920, pp. 27-28. Tests of exposed material show effects of tropical climate.

Glues. See GLUES, Aeroplane.

Laminated Wood. Temperature of Laminations and Time Under Pressure in Gluing Laminated Construction. Eng. Division Air Service, Dayton, O., Technical Orders No. 7, Apr. 1919, pp. 70-73, 1 fig. Tests were made on true mahogany, northern red oak and hard maple. It was determined that heated laminations

glued up with standard hide glue "not only gave joints which remained firm, but which also gave greater uniformity of strength throughout the joint."

McCabe Sleeve. The McCabe Sleeve, I. E. McCabe. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 60-62, 2 figs. McCabe sleeve is a wire-rope fastener applied by use of mechanical means only and has been developed chiefly for use on aircraft. Method of forming it is explained.

Metals, Faults in. Some Faults of Airplane Metals, Walter J. May. Mech. World, vol. 66, no. 1712, Oct. 24, 1919, p. 198, 2 figs. Imperfections in riveting.

Plywood. Data on the Design of Plywood for Aircraft, Armin Elmendorf. Nat. Advisory Committee for Aeronautics, report no. 84, 1920, 15 pp., 6 figs. Results of investigations made by Forest Products Laboratory at Madison, Wis., for army and navy departments. Object of study was to determine, through comprehensive tests, mechanical and physical properties of plywood and how these properties vary with density, number, thickness, arrangement of plies and direction of grain of plies.

Factors Affecting the Warping of Plywood, Armin Elmendorf. Aviation, vol. 8, no. 1, Feb. 1, 1920, pp. 25-26, 4 figs. Result of investigations at U. S. Forest Products Laboratory.

Shear Strength of Plywood Webs. Eng. Division Air Service, Technical Orders, no. 14, March 1920, pp. 47-60, 6 figs. Tests were made to determine shearing strength of plywood and laminated veneer webs and to determine influence of strength of various factors such as number of plies, thickness of various plies, relative direction of grain in plies, distance between shearing forces, length of shearing section, and direction of shearing forces relative to grain of wood.

See also Laminated Wood.

Steel. Steel for the Structural Parts of Aircraft, John L. Harkness. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 466-469. For light machines, ordinary commercial cold-rolled steel is believed to be most suitable; for medium-sized machines, either 0.2-0.3 or 0.3-0.4 heat-treated carbon steel; and for large machines either chrome-nickel or chrome-vanadium steel. Tables of physical properties of chrome-nickel, chrome-vanadium, carbon and nickel steels are included.

Steel Tubing. Report of Test on Steel Tubing and Wing Beams Taken from the Fokker D-VII. Air Service Information Circular, vol. 2, no. 104, Aug. 10, 1920, 4 pp., 6 figs.

Timber, X-Ray Examination of. The Examination of Aircraft Timber by X-Rays, R. Knox and G. W. C. Kaye. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 60-65, 17 figs. on 6 supp. plates. Method of examining aeroplane timber parts by X-rays developed by Aeronautical Inspection Department of Royal Air Force, England. It is said that no difficulty is experienced in detecting by that method concealed knots, resin pockets and grub holes, as well as excess or deficiency of glue in glued joints. It is added that in almost all instances fluorescent-screen examination suffices.

Wing Coverings. Airplane Wing Coverings, Charles J. Cleary. Aviation, vol. 7, no. 11, Jan. 1, 1920, pp. 487-490, 5 figs. Methods of covering aerofoils and methods of testing fabric.

Modern Wing Coverings—Materials Used and Their Application, R. G. Dort. Aerial Age, vol. 10, nos. 9, 11 and 12, Dec. 15 and 29, 1919, and Jan. 5, 1920, pp. 329-330 and 335, 403-406 and 418, and 456-457. Types of pigmented protective coverings; application of wing covering materials. Manner of applying dope and pigmented protective coverings.

Wood. Properties of Woods at 10 Per cent Moisture. Air Service Information Circular, vol. 1, no. 53, May 18, 1920, 7 pp., 1 fig. Data available are said to indicate strongly that following species can be substituted for spruce in highly stressed parts: Port Orford cedar, coast-type Douglas fir, Amabilis, Grand, Noble, and white firs, eastern and western white pine, yellow poplar, cucumber, and magnolia.

Supplies and Production of Aircraft Woods. Nat. Advisory Committee for Aeronautics, report no. 67, 1919, 62 pp., 23 figs. Summary of available information regarding supplies of kinds of wood that have been used or seem likely to become important in construction of airplanes, and on amount of lumber of each species put on market each year.

The Kiln Drying of Woods for Airplanes, Harry D. Tiemann. Nat. Advisory Committee for Aeronautics, report no. 65, 1920, 31 pp., 18 figs. Requirements of wood for use in aircraft are discussed and results obtained in experimental and testing work of Forest Products Laboratory undertaken for Army and Navy during war are given.

See also Plywood; Timber; WOOD, Moisture-Resistant Finishes.

Wooden Parts. Physical, Statical and Dynamical Tests of Woods Used for General Construction and for Aeroplane Parts (Les essais physiques, statiques et dynamiques des bois de construction et d'aviation). Génie Civil, vol. 75, no. 25, Dec. 20, 1919, pp. 627-631, 14 figs. Relative value of tests as criterion of quality of wood. Based on experimental researches at mechanical laboratory of Technical Section of French Military Aeronautics.

[See also STEEL, HEAT TREATMENT OF, Brazed Fittings for Aircraft.]

AIRCRAFT ENGINES

See AEROPLANE ENGINES.

AIRDROMES

See AERODROMES.

AIRPLANES

See AEROPLANES.

AIRSCREWS

See AEROPLANE PROPELLERS.

AIRSHIP FABRICS

See BALLOON FABRICS.

AIRSHIPS

Ceiling. Dynamic Lift and Ceiling for Airships, Alexander Klemin. Aviation, vol. 8, no. 12, July 15, 1920, pp. 466-469, 2 figs. Non-mathematical exposition of the subject of dynamic effects on airship, both in maneuvering and in turn on ceiling, with special reference to two well-known examples of the rigid and non-rigid types.

Chalais-Meudon. The Chalais-Meudon Airship C. M. 5. Automotive Industries, vol. 43, no. 5, July 29, 1920, p. 219, 1 fig. Description of airship built by French Government for U. S. Navy, now purchased by Goodyear Tire and Rubber Co.

Commercial. Airships and Their Commercial Possibilities, R. H. Upson. Jl. Soc. Automotive Engrs., vol. 5, no. 5, Nov. 1919, pp. 349-352 and 375, 5 figs. Describes how airships have been improved within last few years and points out some of the needs for the future, including engines better suited to airship work, better fabric, and better landing facilities.

Airships for Civilian Purposes, W. T. Blake. Aeronautics, vol. 17, no. 321, Dec. 11, 1919, pp. 530-531. Performances of types of 2,000,000-cu. ft. and 70,000-cu. ft. capacities are studied and possibilities of using these types for commercial purposes are deduced.

Development and Effect of Transport and Communication. Jl. Roy. Soc. of Arts, vol. 68, no. 3524, June 4, 1920, pp. 462-471 and (discussion) pp. 471-475. Writer regards airship as having successfully emerged from experimental stage, but he thinks that it is yet to be proven that airship possesses commercial value. He sees fair prospects of eventually successful developments of commercial airships, and answers objections generally made against them.

Construction. French Practice in Airship Construction, John Jay Ide. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 400-402, 3 figs. Specifications for seams of envelopes; precaution taken against explosions when filling dirigibles, and against sparks from atmospheric electricity and radio.

Construction Materials. See AIRCRAFT CONSTRUCTION MATERIALS.

Control Surfaces. See AIRCRAFT, Control Surfaces.

Design. See AERONAUTICS, Problems.

Dynamic Lift and Ceiling. Dynamic Lift and Ceiling for Airships, Alexander Klemin. Aviation, vol. 9, no. 1, Aug. 1, 1920, pp. 16-18, 1 fig. Factors of design affecting dynamic lift.

Electrostatic Effects on. Electrostatic Effects on Airships, Gordon S. Fulcher. Aeronautics, vol. 17, no. 314, Oct. 23, 1919, pp. 386-387. Results of investigation to determine safety precaution in design, construction and operation of airships necessary because of electrostatic effects, undertaken at request of Bur. of Construction and Repair, Navy Dept.

Engines. Airship Machinery: Past Experience and Future Requirements, C. F. Abell. Aeronautics, vol. 18, nos. 335, 336 and 337, Mar. 18 and 25 and April 1, 1920, pp. 244, 260-261 and 273-275. Mar. 18: Description of engines and installation work which were used in various ships built during war. Paper read before Royal Aeronautical Society. Mar. 25: Mechanical equipment of principal types, particularly R 33 and R 34. Apr. 1: It is concluded from examination of machinery installed in various types of airships and from theoretical considerations that engine best adapted for installation in gondola of airship is single-line engine of six cylinders. Reasons given for this demand are that engine of this type gives greater degree of accessibility, exhaust piping arrangement is simplified and space available in gondola is more with this type than with "Vee" engine. Paper read before Royal Aeronautical Society.

The Power Plant of a Modern Airship, W. T. Van Orman. Gas Engine, vol. 22, no. 3, March 1920, pp. 69-73, 6 figs. General requirements of airship engine are pointed out and engine of naval airships built by Goodyear Tire & Rubber Co. is described.

See also AEROPLANE ENGINES, Maybach.

Envelope Pressure. Effect of Envelope Pressure on Airships, R. H. Upson. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 429-430. Effect of high pressure on envelope cloth.

Gas Valves, Automatic. The Goodyear Automatic Gas Valve, A. G. Maranville. Aviation, vol. 8, no. 3, Mar. 1, 1920, p. 111, 2 figs. Summary of practical features as result of several months' experience, including all minor improvements made up to this time.

German. German Airships. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 347-348, 2 figs. Data regarding L 70 class dirigible; maximum diameter, 79 ft.; length, 745 ft.; cubic contents, 242,000 cu. ft.; useful load, 57½ tons; maximum speed, 83¾ m.p.h.; maximum weight of gasoline carried, 44 tons.

Goodyear Pony Blimp. The Goodyear Type A Pony Blimp. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 529-530, 4 figs. Characteristics: Volume, 35,000 cu. ft.; length, 95 ft.; max. diam., 28 ft.; height, 40 ft.; length of car, 12 ft.; power plant, 40-hp.; maximum speed, 40 m.p.h.

Hangars. See HANGARS.

International Flights. A Great Italian Aerial Route (Grandi linee italiane di navigazione aerea), Gill Varolli-Piazza. Rivista Marittima, vol. 53, no. 6, June 1920, pp. 523-540, 1 fig. Advocates inauguration of airship lines radiating from Rome on account of its central position.

Italian. Modern Italian Airships. Flight, vol. 12, no. 26, June 24, 1920, pp. 663-668, 14 figs. Structural details of airships are given, and probable future developments are visualized.

Naval. See Chalais-Meudon.

Non-Rigid. Model Test for Strength and Deformation of Non-Rigid Airship Hulls, J. C. Hunsaker. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 53-54, 3 figs. Aircraft Technical Note, Bureau of Construction and Repair, Navy Dept.

Paris-Algeria Dirigible Service. Paris-Algeria Service by Dirigibles of French Marine During War (Les traversées des dirigeables de la marine de Paris en Algérie pendant la guerre). Aéronautique, vol. 1, no. 8, Jan. 1920, pp. 340-350, 4 figs. Experience is discussed with a view to determine best conditions to insure regular aerial service.

Performance During War. Dirigible Balloons and Airships During the War (Dirigeables et aérostats pendant la guerre), Charles Dollfus. L'Aérophile, vol. 28, nos. 1-2, Jan. 1-15, 1920, pp. 23-30, 7 figs. Structural details and records of operating performances of principal French, English, Italian and German types.

Propellers. See AEROPLANE PROPELLERS, Research.

Purging. Maintenance of Gas Purity by Purging, R. H. Upson. Aviation, vol. 8, no. 3, Mar. 1, 1920, p. 114, 1 fig. Advantages and disadvantages are pointed out of "purging," or replacing certain portion of gas in airship envelope without entirely deflating it.

R.33 and R.34. The Machinery of H. M. Airships R.33 and R.34. Eng., vol. 109, nos. 2831 and 2833, Apr. 2 and 16, 1920, pp. 433-434, 7 figs., and 504-505, 10 figs. partly on supp. plate. Structural details of gondolas. Details of Sunbeam-Coatalen "Maori" engines with which both vessels are fitted.

R.80. H. M. Airship "R.80." Eng., vol. 110, no. 2848, July 30, 1920, pp. 142-145 and p. 150, 27 figs. partly on 4 supp. plates. Dimensions: Overall length of hull, 529 ft. without mooring attachment; gas capacity, 1,250,000 cu. ft., giving gross displacement of 38.25 tons of which 17.8 tons is disposable lift. Section of hull is uniform polygon having 21 sides, and diameter of circumscribing circle at largest part is 70 ft. 7½ in. Overall height of ship from bottom of bumping bags on cars to top of hull is 86 ft. 5 in. when axis is horizontal. Ship is propelled at maximum speed of 65 m.p.h. by four engines carried in three cars suspended from hull structure and developing 1000 hp. at full power. Range at full power is 3900 miles and at normal power 4500 miles.

Resistance. Determination of the Resistance of Airship Models, R. H. Smith. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 44-47. Compara-

tive value of Eiffel and bell-crank aerodynamic balances.

Rigid. Detail Design of Rigid Airships, W. E. Dommett. Aeronautics, vol. 18, no. 324, Jan. 1, 1920, pp. 4-7, 6 figs. Trend of design during recent years, particularly in regard to bracing of fixed fins and mechanism for maneuvering valve for gas bag.

Future Developments of the Rigid Airship, P. Litherland Teed. Sci. Am. Monthly, vol. 1, no. 6, June 1920, pp. 542-543. Methods of utilizing excess hydrogen. From Aeronautical Eng. (supp. to The Aeroplane).

New Type of Rigid Airship. Aeronautics, vol. 18, no. 339, April 15, 1920, p. 318. Type designed by Aerocruiser Co. of America. Structure is described as that of thick inverted "U." It is claimed that channel formation lessens resistance, thereby materially assisting in clearing through air.

Rigid Airship Construction, A. E. Rankin. Flight, vol. 12, no. 16, April 15, 1920, pp. 417-418, 6 figs. Type of bracing is suggested in which only five rivets are used instead of 12 rivets used in conventional type.

Rigid Airships and Their Development, J. E. M. Pritchard. Aeronautics, vol. 18, nos. 330, 331 and 332, Feb. 12, 19 and 26, 1920, pp. 146-147, 164-167 and 182-184. Also in Aeronautical Jl., vol. 24, no. 112, Apr. 1920, pp. 143-171 and (discussion) pp. 171-184, 20 figs., and Flight, vol. 12, nos. 20, 21, 22 and 23, May 13, 20, 27 and June 3, 1920, pp. 525-528, 4 figs., pp. 554-557, 7 figs., pp. 578-581, 4 figs., pp. 597-600, 8 figs. Accepted functions of both military and commercial rigid airships are outlined and divergence between two types indicated. Structural features are discussed, together with problems of mooring, water recovery, and passenger accommodation, especially in regard to their bearing on structure and performance. Comparative study of Zeppelin type and British type of car suspensions. Paper read before Roy. Aeronautical Soc.

The British Rigid Airship R-80 (Le dirigeable britannique rigide R-80). Génie Civil, vol. 77, no. 12, Sept. 18, 1920, pp. 225-230, 14 figs. Detailed description.

The Distribution of Bending Stresses in a Rigid Airship, E. H. Lewitt. Aeronautics, vol. 18, no. 330, Feb. 12, 1920, pp. 140-143, 8 figs. Technical examination of stresses leads to conclusion that built-up tube behaves as heated beam only when (1) cross-section is inscribed in circle, (2) lengths of sides are equal, and (3) there is no variation in size of diagonal wiring in any one bay.

The Effect of Distortion on the Bending Stresses in a Rigid Airship, E. H. Lewitt. Aeronautics, vol. 19, no. 360, Sept. 9, 1920, pp. 196-198, 5 figs. Derivation of formulæ, and results of experiments.

The Effect of Size upon Performance of Rigid Airships, C. I. R. Campbell and H. May. Eng., vol. 109, no. 2831, Apr. 2, 1920, pp. 464-466, 4 figs. Weights of various parts are expressed as function of total lift and formula is developed applicable to all ships of any given type, expressing total fixed weight as proportion of total lift. Curves of performance are given for airships similar in type to R.38 over large range of total lift. Paper read before Instn. Naval Architects.

The Principles of Rigid Airship Construction, A. P. Cole. Aeronautics, vol. 18, nos. 328 and 329, Jan. 29 and Feb. 5, 1920, pp. 101-104, 126-127 and (discussion) 127-130. Also in Flight, vol. 12, nos. 6, 7 and 8, Feb. 5, 12 and 19, 1920, pp. 159, 183-186 and 205-209, 12 figs.; and in Aeronautical Jl., vol. 24, no. 111, March 1920, pp. 98-118 and (discussion) pp. 119-131, 12 figs. Formulas for determining structural strength of airship members. Glossary of terms, mechanical discussion of stresses in the various parts of an airship, and typical designs of German zeppelins and structural characteristics of R34. Paper read before Roy. Aeronautical Soc.

The Transverse Frame of the Rigid Airship, E. H. Lewitt. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, pp. 287-288, 3 figs. Calculation of stress developed in frame.

Vickers Rigid Airship R. 80. Aeronautics, vol. 19, no. 363, Sept. 30, 1920, pp. 243-245, 2 figs. Designed for use for long patrol cruises over sea and particularly to obtain greatest endurance and speed possible. Capacity is only 1,250,000 cu. ft., but airship is said to give performance in speed and endurance equal to that of R. 33 and R. 34. Dimensions: Overall length, 530 ft.; diameter, 70 ft.; height, 85 ft.; engines, four of Wolseley-Maybach type of 230 b.hp.

Schütte-Lanz. Design and Efficiency of Airships (Luftschiffe und deren Leistungsfähigkeit), D. Rühl. Ingenieur, vol. 35, no. 25, June 19, 1920, pp. 438-451 and (discussion) pp. 452-454, 23 figs. Description of Schütte-Lanz airship. Dimensions: Capacity, 2,048,360 cu. ft.; overall length, 650 ft. 8 in.; max. diam., 75 ft. 6 in.; carrying capacity, 37.5 tons. It is provided with five 240-hp. motors capable of developing speed of 62 mi. per hr. Address delivered before Department for Ship & Machine Constr. of the Roy. Inst. of Engrs., Amsterdam.

New Schütte-Lanz Construction. Aviation, vol. 9, no. 5, Oct. 1, 1920, p. 165. Airship has capacity of 2,048,360 cu. ft., overall length of 650 ft. 8 in. and maximum diameter of 75 ft. 6 in. It is provided with five 240-hp. Maybach motors which give it maximum speed of 62 m.p.h. Carrying capacity is 37.5 tons.

The Importance of the Schütte-Lanz Dirigibles (Die Bedeutung der Schütte-Lanz-Luftschiffe), D. Rühl. Luftfahrt, vol. 24, no. 3, Mar. 4, 1920, pp. 38-40, 6 figs. Details of various models and table giving most important data of the characteristics of Schütte-Lanz dirigibles. Attributes present-day high efficiency and degree of perfection of rigid type of dirigible to adoption of form of minimum air resistance, to simple steering gear, elastic suspension of nacelle, etc.

Semi-Rigid. The Italian Semi-Rigid Airship Roma. Aerial Age, vol. 11, no. 14, June 14, 1920, p. 478, 2 figs. Characteristics: Volume, 1,200,000 cu. ft.; total weight, 34 gross tons; length, 125 m.; beam, 25 m.; height, 27.5 m.

The New Italian Usuelli Semi-Rigid Airship. Flight, vol. 12, no. 40, Sept. 30, 1920, pp. 1044-1045, 4 figs. Principal feature is rigid keel which consists of triangular-section girder framework extending from nose to stern, located outside envelope, apex downward, flush with bottom of latter. Principal characteristics of "Roma," as new airship is called, are overall length, 410 ft.; diameter, 82 ft. 6 in.; height, 90 ft. 3 in.; capacity, 1,200,000 cu. ft.; weight, fully loaded, 37 tons; maximum speed, 80 m.p.h.

Slow-Speed. Airships for Slow-Speed Heavy Transport and Their Application to Civil Engineering, T. R. Cave-Browne-Cave. Eng., vol. 110, no. 2853, Sept. 3, 1920, 331. Possibilities of developing such airships. Paper read before Eng. Section, British Assn. for Advancement of Science.

Steam Propulsion. Airships, T. R. Cave-Browne. Cave. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, pp. 277-280. Table showing strength of various fabrics, method of making ballast during flight and possibilities of using steam

engine for airship propulsion. Paper read before Eng. Section of British Assn.

Stresses in Flight. Directional Stability and Control of Airships, Ralph H. Upson. Aviation, vol. 8, no. 6, April 15, 1920, pp. 238-241, 4 figs. Graphical study of stresses developed in airship hull in various positions during flight, such as when making a turn, etc.

Testing Models. Wind Tunnels and Airship Model Testing, R. N. Wing. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 56-58, 5 figs. Their importance for designing airships, reducing accidents and eliminating useless expense in developing aircraft.

Transoceanic Service. See AEROPLANES, Transoceanic Service.

Use in Future Wars. See AEROPLANES, Use in Future Wars.

Wireless Equipment. See AERONAUTICS, Problems.

Zeppelins. The Development of Aircraft with Special Consideration of the Zeppelin Dirigibles (Studien zur Entwicklung der Luftfahrzeuge unter besonderer Berücksichtigung der Zeppelin-Luftschiffe), P. Jaray. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, nos. 11 and 12, June 15 and June 30, 1920, pp. 153-159 and 173-178, 9 figs. From the calculated values shown in curves, conclusions regarding further development of aircraft are drawn which emphasize the marked superiority of the dirigible and establish that the giant aeroplane cannot be future popular medium of air traffic. Points out that only small aeroplane can compete with small dirigible and that no plane can compete with large dirigible. Includes tabular data of different types of Zeppelin dirigibles.

The L-72 Zeppelin at Maubeuge (Le Zeppelin "L-72" à Maubeuge). Aérophile, vol. 28, nos. 13-14, July 1-15, 1920, pp. 196-198, 7 figs. Dimensions: Length, 226 meters; diameter, 26.6 meters; capacity, 68,500 cubic meters; ascensial force, 80,000 kg.

Zodiac ZD-US 1. The Zodiac Airship ZD-US 1, John Jay Ide. Aviation, vol. 8, no. 3, Mar. 1, 1920, pp. 107-108, 4 figs. Characteristics: Type, nonrigid; rigging, external; length of envelope, 262.5 ft.; diameter, 50.2 ft.; width over fins, 59 ft.; overall height, 72.2 ft.; length of car, 54.7 ft.; width of car, 4.9 ft.; maximum speed, 50 m.p.h.; endurance, 14 hr. at full speed.

[See also BALLOONS.]

ALARM SIGNALING

Siren System, Luxemburg. Electric Siren Alarm Signal Stations for Protection Against Air Raids in Diedenhofen and Luxemburg (Elektrische Sirenenalarmanlagen zum Schutze gegen Fliegerangriffe im Festungsbereich Diedenhofen und in Grossherzogtum Luxemburg), J. Wiligut. Elektrotechnische Zeitschrift, vol. 40, no. 40, Oct. 2, 1919, pp. 489-492, 9 figs. Demonstrates possibility of alarm signaling over extended territory, either in sections or over entire area, and with absolute safety.

ALCOGAS

See GASOLINE, Alcogas vs. Aviation Gasoline.

ALCOHOL

Automobile Fuel. See AUTOMOBILE FUELS, Alcohol.

By-Product of Coal Distillation. Alcohol—A New By-Product of Coal Distillation (L'alcool, nouveau sous-produit de distillation de la houille), E. de Loisy. Revue de Métallurgie, vol. 17, no. 2, Feb. 1920, pp. 56-62. Process at Skinningrove Works, England. Cold charcoal absorbs ethylene from gases and gives it off when heated.

Alcohol from By-Product Gas. Gas Age, vol. 45, no. 7, Apr. 10, 1920, pp. 294-295. It is reported that motor fuel prospects in England have been brightened by the Skinningrove experiments converting ethylene into alcohol.

Coke-Oven Gas as Source of. A New By-Product from Coke-Oven Gas. Iron Age, vol. 106, no. 1, July 1, 1920, pp. 13-14. Work carried out at Skinningrove near New Castle, England. Translated from Revue de Métallurgie.

Ethyl Alcohol from Coke Oven Gas, Ernest Bury and O. Ollander. Am. Gas Eng. Jl., vol. 112, no. 10, Mar. 6, 1920, pp. 179-183. Writers expressed their conviction before Cleveland Instn. Engrs. that alcohol extraction from coke-oven gas is commercially practical in Great Britain. Sequence of process for successful recovery of ethylene by means of concentrated sulphuric acid in connection with ordinary by-product recovery plant is defined.

The Recovery of Industrial Alcohol from Coke Oven Gases. Gas World, vol. 73, no. 1885, Sept. 4, 1920, pp. 13-16, 1 fig. Bury and Ollander process for recovery of ethylene and its homologues from gases of distillation by use of sulphuric acid and subsequently to convert acid sulphates into industrial alcohol. Report of Fuel Economy Committee of British Assn. for Advancement of Science.

Ether-Alcohol-Air Mixture, Ignition of. The Ignition of Ether-Alcohol-Air and Acetone-Air Mixtures in Contact with Heated Surfaces, Albert Greville White and Tudor Williams Price. Jl. Chem. Soc., vols. 115 and 116, no. 686, Dec. 1919, pp. 1462-1505, 9 figs. Values determined were, 187 deg. cent. for ether-air mixtures in glass, from 187 to about 500 deg. cent. for different ether-alcohol-air mixtures, and about 500 deg. cent. for acetone-air mixtures. Presence of appreciable quantities of metal in vessels used was found to lower sub-ignition-temperature.

Ethyl, from Wood. Ethyl Alcohol from Wood, F. W. Kressman. Chem. Age, vol. 2, no. 1, Jan. 10, 1920, pp. 319-321. Successful production of ethyl alcohol from wood is visualized to depend primarily upon steady uniform supply of wood waste available at low price for period of twelve years or more.

Ethylene from Coke-Oven Gas. Ethylene as Alcohol from Coke-Oven Gases. Ernest Bury and O. Ollander. Iron and Coal Trades Rev., vol. 99, nos. 2703 and 2704, Dec. 19 and 26, 1919, pp. 804-805 and 831-832. Possibilities of producing absolute alcohol from coke-oven gas are pointed out and chart is given illustrating derivation of alcohol and its derivatives from coke-oven gas. Ethylene is said to be absorbed by coke-oven gas at temperature of 60 to 80 deg. cent. Paper before Cleveland Instn. of Engrs.

Fuel. Three New Sources of Fuel Alcohol. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 80-83. Processes for production of alcohol from molasses, wood waste and acetylene described in technical appendices to German wartime law creating an alcohol monopoly. Commercial prospects of processes are discussed.

See also AUTOMOBILE FUELS, Alcohol.

Industrial. Industrial Alcohol, Burnell R. Tunison. Jl. Franklin Inst., vol. 190, no. 3, Sept. 1920, pp. 373-420, 24 figs. Notes on manufacture of alcohol for industrial purposes. Nature and scope of alcohol industry and vast number of other industries in which industrial alcohol is a necessity are pointed out, and favorable legislation concerning industrial alcohol and stimulation of those industries which

have not yet attained their proper expansion in United States.

Industrial Alcohol, James M. Doran. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 316-317. Industry in United States. Effects of Prohibition Act.

Industrial Alcohol in Sweden (Spritindustrien), Alf Larson. Teknisk Tidskrift (Kemi och Bergsvetenskap), vol. 50, nos. 6 and 7, June 23 and July 28, 1920, pp. 89-90 and 143-149. Manufacture of alcohol as by-product from wood pulp. Nine new factories have combined output of 5,000,000 gallons of 95 per cent alcohol.

Science and Industrial Alcohol, Burnell R. Tunison. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 474-480, 12 figs. Development of alcohol industry caused by chemistry and allied sciences. Production involving raw materials, synthesis and fermentation. Recovery, involving distillation, rectivication and purification. By-products obtained and unsolved problems.

Symposium on Industrial Alcohols. Chem. & Metallurgical Eng., vol. 21, no. 11, Oct. 29 and Nov. 5, 1919, pp. 557-559, 1 fig. Presented at meeting in N. Y. Section of Am. Chem. Soc. Attention is focussed upon production and industrial uses of more important alcohols. Chart showing several uses of alcohol is given.

Prohibition, Industrial Aspects of. Industrial Alcohol under the New Law and Regulations, Burnell R. Tunison. Chem. & Metallurgical Eng., vol. 22, no. 11, Mar. 17, 1920, pp. 513-518. Interpretation of industrial aspects of National Prohibition Act and regulations 60 and 61. Formulæ which have been authorized for completely denatured alcohol which may be sold, distributed and used, without any restriction, regulation or taxes are given, and possibilities of obtaining pure ethyl alcohol for scientific purposes are pointed out.

Sulphite Waste Liquor as Source. Determination of Methyl Alcohol in Sulfite Liquor, Clarence J. West. Paper, vol. 27, no. 3, Sept. 22, 1920, p. 28. Describes W. König's method in which carbon dioxide resulting from oxidation of methyl alcohol is absorbed and weighed. Translated from Papier-Fabrikant, vol. 18, no. 33, 1920, pp. 611-615.

Recovery of Alcohol from Waste Sulphite Liquor, Ralph H. McKee. Chem. Age (N. Y.), vol. 28, no. 7, July 1920, pp. 237-239. Disadvantages of old process and advantages of new method given.

Various Methods of Utilizing Sulphite Waste Liquors, Ralph H. McKee. Paper, vol. 26, no. 20, July 21, 1920, pp. 21-23. Details of method of operation and cost of production under sulphite process of commercial production of alcohol from waste liquors. Fuel value of residue.

Synthetic. Synthesis of Alcohol by Loisy Process (L'alcool de synthèse par le procédé de Loisy). Journal des Usines à Gaz, vol. 44, no. 13, July 5, 1920, pp. 193-195. Reaction consists of absorption of ethylene by concentrated sulphuric acid with formation of sulphovinic acid, saponification of this by water, with regeneration of dilute sulphuric acid and production of alcohol.

Wood. Wood Alcohol—A New Industrial Monarch. Sci. Am., vol. 121, no. 19, Nov. 8, 1919, p. 462, 3 figs. Its production and utilization in United States during and since war.

ALCOHOL ENGINES

Design. Alcohol as Fuel, J. L. Chaloner. Automobile Engr., vol. 10, no. 138, May 1920, pp. 183-185, 2 figs. Notes on design and construction of alcohol engines.

ALERION

See AEROPLANES, Lacoin-Damblanc.

ALGEBRA

Linear Associative. A Linear Associative Algebra Suitable for Electromagnetic Relations and the Theory of Relativity, W. J. Johnston. Proc. Roy. Soc., vol. 96, no. A 678, Dec. 15, 1919, pp. 331-333 and (discussion) pp. 334-363. Associative algebra of 16 units based on four fundamental units together with their products, each with factors in definite order and scalar unit 1. In the discussion this symbolic calculus is considered in connection with electrodynamic relativity and significance is studied of introducing quaternion notation into electrodynamics.

ALIGNMENT CHARTS

See FORESTRY, Mensuration.

ALLEYS

Paving. See PAVEMENTS, CONCRETE, Alleys.

ALLOY STEELS

Coefficient of Expansion. The Coefficient of Expansion of Alloy Steels, John A. Mathews. Min. & Metallurgy, no. 158, section 8, Feb. 1920, 4 pp. Measurements were effected for various alloy steels at temperature range from 25 to 100 deg. cent. Values obtained ranged from 11.37 to 12.76 parts per million per deg. cent.

Commercial. Steels for Commercial Purposes, Hartland Seymour. Machy. (Lond.), vol. 15, no. 377, Dec. 18, 1919, pp. 364-365. Effects of manganese, nickel, chromium and vanadium on steel.

Heat Treatment. Some Commercial Heat Treatments for Alloy Steels, A. H. Miller. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 506-508, 11 figs. Deals with heat treatment of alloy steels used for structural purposes, specially of nickel and nickel-chrome steel, and describes series of tests which were conducted to determine effect of various heat treatments on samples of same chemical composition, results being illustrated by series of photomicrographs showing effect of different adjustments of temperature, time and rate of cooling of heat treatment.

See also STEEL, HEAT TREATMENT OF, Alloy Steels.

Impact Tensile Tests. Impact Tensile Tests with Alloy Steels (Schlagzugversuche mit Sonderstählen), A. Gessner. Stahl u. Eisen, vol. 40, no. 23, June 10, 1920, pp. 781-783, 1 fig. Results of impact tests show that allow steels of pronounced tenacity, even up to a tensile strength of 100 kg. per sq. mm. and in spite of the extremely short duration of the impact stress—0.003 to 0.005 sec.—give higher values for elongation, construction and resilience than those with steady stress in the static tests.

Manufacture. The Production of Tool Steel, Fred R. Daniels. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 42-46, 8 figs. Processes employed in steel mill of Ludlum Steel Co., Watervliet, N. Y., which is engaged exclusively in manufacture of tool and special alloy steels.

Metallurgy of. Progress in Metallurgy of Alloy Steels, Harold F. Wood. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 25-27. No material change is seen in basic principles of alloy-steel production during 1919. It is said that lessons learned during war showed clearly that good alloy steel can be made by either electric-furnace, crucible or open-hearth process, and that also by merely specifying process to be used does not insure buyer of high-quality product.

Pickling, Effect of. Effect of Pickling on Alloy Steels, H. L. Hess. Iron Age, vol. 105, no. 9, Feb. 26, 1920, pp. 593-594, 6 figs. Tests made by metallurgical department of Hess Steel Corporation, Baltimore, Md., to determine degree of interference with quality and machinability of material. It was concluded that pickling in itself, as well as pickling followed by various treatments, does not interfere in any noticeable way with quality or machinability of steel.

Tempering, Effect on Hardness. Effect of Tempering on the Hardness of Alloys (Action systématique de la trempe sur la dureté des alliages), L. Grenet. Technique Moderne, vol. 12, no. 3, Mar. 1920, pp. 107-112, 2 figs. Remarks on internal structure of tempered alloys, particularly alloy steels.

Tool Steel. Tool Steel's Influence on Progress and Prosperity. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 54-59, 10 figs. Alloy steels intermediate between carbon and high-speed steels are described. Ingot improvements by Gathmann molds patented by the Gathmann Eng. Co. of Baltimore, are pointed out and illustrated.

[See also CHROME STEEL; CHROME-NICKEL STEEL; HIGH-SPEED STEEL; MOLYBDENUM STEEL; NICKEL STEEL; NICKEL-CHROME STEEL; Etc.]

ALLOYS

Acid-Resisting. Copper-Aluminum-Iron Bronze as an Acid-Resisting Alloy, O. L. Kowalke. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 37-38. Results of tests.

Aluminum. See ALUMINUM ALLOYS.

Amalgams. Transition Phenomena in Amalgams, Arthur W. Gray. Min. & Metallurgy, no. 165, Sept. 1920, pp. 18-19. During earlier investigation and also during various crushing strength tests, author noticed that amalgams from alloys containing 1 per cent or so of zinc became studded with brilliant crystals when heated into transition region, while similarly treated amalgams from non-zinc alloys did not. (Abstract.)

Cadmium-Arsenic. An Alloy Substitute for Tin and Antimony (Legierung als Zinn-bzw. Antimonersatz). Metall-Technik, vol. 46, nos. 5-6, Feb. 3, 1920, pp. 19-20. According to a process recently patented, cadmium is alloyed with arsenic to form substitute for tin.

Copper. See COPPER ALLOYS.

Corrosion-Resisting. Alloys of High Corrosion Resistance (Gegen Korrosion widerstandsfähigere Legierungen), Hugo Rieger. Giesserei-Zeitung, vol. 16, nos. 19 and 20, Oct. 1 and 15, 1919, pp. 289-291 and 316-319. Circumstances to be considered in choice of alloy. Formulæ are given for armature gun-metal alloys employed in manufacture of gages, pump cases, plungers, valves and other parts in distilleries and breweries, sugar factories, canneries, etc.; and also for manufacture of vessels for production of alcoholic beverages and sugar, various chemical products, aniline dyes, etc.

Dental. An Investigation of the Physical Properties of Dental Materials, Wilmer H. Souder and Chauncey G. Peters. Technologic Papers, Bur. of Standards, no. 157, May 22, 1920, 40 pp., 25 figs. Results of measurements of crushing strength, thermal and chemical expansions, and analyses of chemical composition, electrode-potentials and thermal reactions of dental alloys.

Developments. Alloys of the Past and Present, Colin G. Fink. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 471-473, 2 figs. Review of recent developments in production of pure metals, ferroalloys, bronzes and brasses and of increasing uses for less common metals and their alloys. Research suggestions for production of special alloys.

Electric Production of. The Electrical Production of Alloys, Ralph M. Major. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 33, pp. 441-447, 2 figs. Account of producing alloys in two Héroult furnaces having different electrode regulating equipment, also discussion of general conditions of electric melting as compared with any other process of producing alloys. Manufacture and properties of Nichrome, Kromore, Mangaloy, Climax, and Inbar, are included.

Electrical Melting. Electrical Melting of Alloys, H. W. Gillett. Foundry, vol. 48, beginning no. 4, Mar. 1, 1920 (on p. 177), and continuing through nos. 5-17. A discussion of the evolution of the electric furnace for melting nonferrous metals, in which the essential and desirable features of different types of furnaces are outlined and distinctions are drawn between their relative merits. The future of electric furnace in alloy industry is considered as a whole and in reference to the different types of furnaces and possibilities of each class.

Hardness of. Hardness of the Most Important Alloys for Technical Purposes, P. Ludwik. Metal Industry (Lond.), vol. 16, no. 7, Feb. 13, 1920, pp. 125-129, 5 figs. Hardness of most important alloys of copper, tin, lead, zinc and aluminum is examined, both in case of cast specimens which have been suddenly quenched and those which have been annealed by means of chemical pressure in order to establish hardening effect on various individual constituents of alloys. Translated from Zeitschrift des Vereins deutscher Ingenieure.

Heat-Resisting. Nichrome: A Heat-Resisting Alloy. Am. Mach., vol. 52, no. 26, June 24, 1920, pp. 1347-1348, 3 figs. Describes metallic alloy compounded from nickel, chromium and iron, with tensile strength of 20,000 to 55,000 lb. per sq. in. when cold and possessing in remarkable degree the property of maintaining large portion of this strength at temperatures that would render iron or steel nonresistant.

See also CASE-HARDENING, Heat-Resisting Alloys for.

Heusler Magnetic. The Heusler Alloys (Ueber heuslersche Legierungen), O. V. Auwers. Zeitschrift für anorganische and allegemeine Chemie, vol. 108, no. 1, Aug. 13, 1919, pp. 49-69, 7 figs. Discussion of magnetizable alloys of non-magnetic metals, with particular reference to Heusler alloys, together with notes on chemical and physical investigations and thermal data.

Impact Tests. Study of Impact Tests on Alloys, Austin B. Wilson. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 616-617 and 622, 3 figs. Tests made on impact-shear machines and on alternating-impact testers indicated relative value of various alloys. Machining of bars found to be unnecessary for impact-shear test.

Iron. See IRON, Alloys; and IRON ALLOYS.

Iron-Nickel. See IRON-NICKEL ALLOYS.

Magnesium. See MAGNESIUM ALLOYS.

Magnetic. See Heusler Magnetic.

Manganese. See MANGANESE, Alloys.

Manganese-Gold. Manganese-Gold Alloys (Die Legierungen des Mangans mit Gold), L. Hahn and S. Kyropoulos. Zeitschrift für anorganische und allgemeine Chemie, vol. 95, nos. 1-2, May 5, 1916, pp. 105-114, 2 figs. Results of experiments are given and compared with those of N. Parravano (Gazz. chim. Ital. 45 I, 1915, p. 293). Notes on composition of the residue of gold-manganese alloys not

soluble in acids as compared with that of the original alloys.

Melting, Waste in. Waste in Melting of Alloys, E. H. Schulz and H. Winkler. Metal Industry (Lond.), vol. 15, no. 13, Sept. 26, 1919, pp. 241-242; also Metal Industry (N. Y.), vol. 17, no. 12, Dec. 1919, pp. 521-522. Experimental meltings carried out (1) with 33 per cent of new metal and 67 per cent of old brass scraps and turnings and (2) 80 per cent scraps and 20 per cent of new copper and zinc. It was concluded that melting in hearth furnace with addition of 60 to 67 per cent of scrap of somewhat poor quality will result in loss of 7.5 per cent of charge. Translated from Metall. und Erz.

See also Electrical Melting; NON-FERROUS METALS, Electrical Melting.

Metallography. Micrographic Similarities Among Carbon Steels, Brasses, Copper, Bronzes and Aluminum Bronzes (Similitudes d'aspect micrographique existant aux divers états, entre les alliages fer-carbone (aciers), cuivre-étain (bronzes d'etain), cuivre-zinc (laitons) et cuivre-aluminium (bronzes d'aluminium), A. Portevin. Comptes rendus des Seances de l'Academie des Sciences, vol. 171, no. 6, Aug. 9, 1920, pp. 350-353, 3 figs. Experimental observations. Photomicrographs.

Nickel. See NICKEL ALLOYS.

Nickel-Chromium. Nickel-Chromium Alloys, W. A. Gatward. Proc. Engrs. Soc. Western Pa., vol. 35, no. 9, Dec. 1919, pp. 449-458 and (discussion) pp. 459-465. Table giving properties of different alloys available for resistance purposes is included.

Nickel-Iron. See NICKEL-IRON ALLOYS.

Non-Ferrous, from Scrap Metals. The Manufacture of Non-Ferrous Alloys from Scrap Metals. Metal Industry (London), vol. 15, no. 24, Dec. 12, 1919, p. 479. Method of proportioning mixture.

Non-Ferrous, Standards for. New Standards for Metals. Metal Industry (N. Y.), vol. 18, no. 8, Aug. 1920, pp. 349-350. Reports on composition and nomenclature of non-ferrous alloys at 1920 meeting of Am. Soc. for Testing Matls.

Progress During War. Improvements in Alloys and Metal Treatment (Ueber Fortschritte auf dem Gebiet der Legierungskunde und Metallverarbeitung), E. H. Schulz. Metall u. Erz, vol. 17, nos. 10 and 11, May 22 and June 8, 1920, pp. 229-233 and 251-256. Brief review of progress during war in investigation of constitution and recommendations of new alloys, production (smelting and annealing), treatment by swaging and annealing, and investigation of properties.

Progress in 1919. See METALS, Progress in 1919.

Research. Thermo-Electromotive Force and Alloy Research, John L. Haughton. Eng., vol. 109, no. 2841, June 11, 1920, pp. 803-807, 8 figs. Study of thermal electromotive force as aid to investigation on constitution of alloy systems, with appendix on Peltier and other effects. Paper read before Inst. of Metals.

Standardization of. See METALS, Standardization of.

Ternary, Model for. A Model for Representing the Constitution of Ternary Alloys, Walter Rosenhain. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 527-529, 4 figs. Model constructed of wires of various thicknesses and colors at National Physical Laboratory, Eng.

Tin. See TIN ALLOYS.

Titanium. See TITANIUM, Alloys.

Various, Tests of. Alloys (Alliages), Maillard. Fonderie Moderne, vol. 12, no. 8, Aug. 1919, pp. 170-172. Physical tests conducted by various companies with copper-zinc-lead, aluminum-beryllium and zirconium-nickel alloys.

White Metal, Melting. Soft Metal Melting by Gas, Gilbert C. Shadwell. Metal Industry, N. Y., vol. 18, no. 1, Jan. 1920, pp. 18-20, 2 figs. Exposition of advantages of melting and mixing white metals, using gas as fuel.

White-Metal, Pouring. Pouring Lead, Zinc and White Metal Alloys. Metal Industry, vol. 15, no. 12, Sept. 19, 1919, pp. 221-222, 7 figs. Device in which plug is mounted outside pot but close up against it is considered better arrangement to mounting tapping plug inside pot. Machine for rapid casting metal bars is illustrated.

Zinc. See ZINC ALLOYS.

[See also BEARING ALLOYS; BRITANNIA METAL; BRASS; BRONZES; NON-FERROUS METALS.]

ALOXITE

See ABRASIVES, Aloxite.

ALPHA RAYS

See RADIOACTIVITY, Alpha Rays.

ALTERNATING ELECTRIC CURRENTS

Rectifiers. See RECTIFIERS.

ALTERNATORS

See BEARINGS; THRUST; ELECTRIC GENERATORS, A. C.

ALUMINA

See REFRACTORIES, Alumina.

ALUMINUM

Aircraft Uses. Aluminum in Aeronautics (L'aluminium dans l'aéronautique), M. Grard. Aéronautique, vol. 1, no. 6, Nov. 1919, pp. 227-236, 11 figs. Graphs showing variations of mechanical characteristics of traction corresponding to various percentages of rolling.

Analysis, Method of. The Analysis of Aluminum, Its Compounds and Alloys, J. E. Clennell. Min. Mag., vol. 22, no. 2, Feb. 1920, pp. 88-93. General survey of methods of analysis, methods of separation of aluminum, gravimetric methods for estimation of aluminum in pure substances, and details of separation and estimation of aluminum by gravimetric analysis.

Automobile Uses. The Use of Aluminum in the Present and the Future Motor Car, Ferdinand Jehle. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 367-372, 6 figs. Use of aluminum alloys in pistons, crankcases, cylinder blocks, oil pans, inlet manifolds, bodies, etc., is noted, and it is visualized that wheels, rear-axle housings and similar parts will be aluminized in near future.

British Foundry Practice. British Aluminum Foundry Practice. Metal Industry (N. Y.). vol. 18, no. 5, May 1920, pp. 221-224. From booklet of British Aluminum Co., Ltd., London.

Castings. Casts Large Tonnage of Aluminum. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 17-23, 13 figs. Attention is called to system in Detroit foundry, which permits continuous pouring and automatic removing of castings from moulding floor.

Casting Losses in Aluminum-Foundry Practice in the United States, Robert J. Anderson. Metal Industry (New York), vol. 18, no. 7, July 1920, p. 318. Report of an investigation for Bur. of Mines, Department of Interior, giving defects causing losses, monetary values of losses, etc.

Investigate Hard Spots in Aluminum, Rob-

ert J. Anderson and Julian H. Capps. Foundry, vol. 48, no. 9, May 1, 1920, pp. 337-342, 23 figs. Investigations at Bur. of Mines are said to have disclosed that hard spots in aluminum-alloy sand castings are caused by metallic and non-metallic inclusions. Metallic inclusions are said to be due to admixtures of iron, and non-metallic are attributed to carelessness.

See also FOUNDRIES, Aluminum-Castings.

Corrosion. Rate of Corrosion of Aluminium, G. H. Bailey. Jl. Soc. Chem. Indus., vol. 39, no. 9, May 15, 1920, pp. 118T-120T, 2 figs. Bailey's empirical formula is said to be confirmed by results obtained in series of experiments extending over ten years. Extent of corrosion in terms of metal corroded per day per 100 sq. cm. of surface is expressed by $CR = 9/8 (S + w - W)$ where W is weight of sheet employed, w its weight after exposure, and S weight of precipitate obtained from corrosive liquid after ignition. (See Jl. Inst. Metals, 1912, vol. 9, p. 79.)

The Action on Aluminum of Hard Industrial Waters, Richard Seligman and Percy Williams. Eng., vol. 109, no. 2828, Mar. 12, 1920, pp. 362-364. Metal Industry (Lond.), vol. 16, no. 12, March 19, 1920, pp. 233-236. From results of experiments it is concluded that pitting is dependent upon simultaneous presence of chlorides and bicarbonates of either calcium or sodium, or in all probability of other metals. Experiments were also made to compare various methods for protecting aluminum from corrosion, and in this connection, heating of metal, immersion in ammonia and in solutions of phosphate and bircarbonate of soda, or addition of lime water to industrial water, were found effective.

Dross. The Evaluation of Aluminum Dross, F. K. Bezzenberger. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 78-79. Procedure at Lynite Laboratories, Aluminum Castings Co., Cleveland, Ohio.

Electroaffinity of. The Electroaffinity of Aluminum, Jaroslav Heyrovsky. Jl. Chem. Soc., no. 687, Jan. 1920, pp. 11-36, 2 figs. From conductivity data and e.m.f. measurements of aluminum chloride concentration cells, amount of ionization and hydrolysis was determined and gradual ionization of cations calculated. Various potentials of passive aluminum were also measured. Influence of anion on potential dissolution and deposition of metals is discussed.

Foundry Losses. Casting Losses in Aluminum-Foundry Practice in the United States, Robert J. Anderson. Monthly Reports of Investigations, Bur. of Mines, Dept. of Interior, April 1920, 3 pp. Average casting loss, including rejections of all kinds on foundry floor, in inspection department and machine-shop returns, is placed at 10 per cent. Variations in losses range, it is said, from 0 to 75 per cent.

Industry, Germany. The Aluminum Industry in Germany During and After the War (L'industrie de l'aluminium en Allemagne pendant et après la guerre), M. L. Descroix. Revue de Métallurgie, vol. 17, no. 4, April 1920, pp. 275-285. Economical study based on data published in German periodicals.

Labrador Stone. A New Raw Material for Production of Aluminum (Ein neuer Rohstoff für Aluminium-herstellung), Dr. Saller. Prometheus, vol. 30, no. 48, Aug. 30, 1919, pp. 380-381. It is said that a new material has been discovered in Norway, called Labrador stone, an eruptive rock composed chiefly of labradorite, a mixture of the feldspar, anorthite and the feldspar, albite, but more closely allied to former; contains about 30 per cent alumina. (Tidskrift for Kemi, 1919, no. 2, Goldschmidt.)

Navy Specifications. Aluminum Rolling-Mill Practice. Commercial Pig and Scrap, Robert J. Anderson and Marshall B. Anderson. Chem. & Metallurgical Eng., vol. 22, no. 11, Mar. 17, 1920, pp. 489-491. Navy Department specifications for pig aluminum are included.

New Uses. Commercial Aspects of Aluminum, W. C. Hirsch. Raw Material, vol. 1, no. 9, Dec. 1919, pp. 419-425, 10 figs. How aluminum is made and why new uses were developed for it during war.

Nickel Plating. Nickel Plating of Aluminum (Nickelage de l'aluminium), Léon Guillet and M. Gasnier. Revue de Métallurgie, vol. 17, no. 5, May 1920, pp. 351-359, 10 figs. Results obtained by first roughening surface of aluminum with sand blast, also with preliminary copper plating before plating with nickel.

Powder, Inflammability of. A Study of the Inflammability of Aluminium Powder, Alan Leighton. Metal Industry (London), vol. 15, no. 5, Aug. 1, 1919, pp. 81-83. Properties affecting inflammability are discussed and list of precautions to be observed is formulated.

Protective Coating for. Protective Coating for Aluminum (Brünieren von Alumínium), L. von Grotthuss. Metall u. Erz., vol. 17, no. 2, Jan. 22, 1920, pp. 39-40, 7 figs. Description of an electrolytic process for giving to aluminum a durable brown coating which is proof against action of city and sea water, by the use of a molybdenum solution.

Rolling-Mill Practice. Aluminum Rolling-Mill Practice—Melting Furnaces, Ingot Pouring, Robert J. Anderson and Marshall B. Anderson. Chem. & Met. Eng., vol. 22, no. 12, March 24, 1920, pp. 545-550. Comparative study of continuous and intermittent melting prior to casting rolling-mill ingots.

Aluminum Rolling-Mill Practice—Ingot Heating and Mill Calculations, Robert J. Anderson and Marshall B. Anderson. Chem. & Met. Eng., vol. 22, no. 13, March 31, 1920, pp. 599-604. Specifications and some of uses for sheet aluminum are given, together with discussion of furnaces for heating ingots preparatory to slabbing. Tables and examples of calculations are included whereby individual orders may be rolled with minimum allowance for scrap.

See also ROLLING MILLS, Aluminum Sheet.

Specifications. See NON-FERROUS METALS, Specifications.

Spontaneous Oxidation in Air. Spontaneous Oxidation of Aluminum in Air (Sur l'aluminium spontanement oxydable a l'air), E. Kohn-Abrest. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1393-1395. Writer reports that aluminum 99.3 per cent pure volatilizes at 1100 deg. cent. He also gives account of various phenomena which took place by sublimating aluminum vapor on iron bars.

Substitution for Steel. Notes on the Uses of Aluminum (Notes concernant quelques applications de l'aluminium), M. Legrand. Industrie des Tramways et Chemins de Fer, vol. 13, nos. 151-152-153, July-Aug.-Sept. 1919, pp. 77-80. Discusses economy of substituting aluminum for steel in automobile and electrical industries.

Uses in Telegraphy and Telephony. Uses of Aluminum in Telegraphy and Telephony (Aluminium in Telegraphen- und Fernsprechbetrieb), Ulfilas Meyer. Elektrotechnische Zeitschrift, vol. 41, no. 9, Feb. 26, 1920, pp. 170-171. Results of experiments carried out in Telegraphic Experimental Bureau are said to show that in using aluminum for cable lines certain difficulties are met with, and means for diminishing these are suggested. Use of aluminum as bus-bars in engine and storage-battery rooms is said to give satisfactory results; in paper condensers aluminum foil was substituted for tin foil and results are discussed.

ALUMINUM ALLOYS

Uses. Aluminum in Aeronautics (L'aluminium dans Paéronautique), M. Grard. Aéronautique, vol. 1, no. 5, Oct. 1919, pp. 183-187, 7 figs. Introductory statement giving statistics of world production of aluminum and its physical and chemical characteristics.

Industrial Uses of Aluminum (Quelques applications industrielles de l'aluminium), Jean Escard Revue d'Électrométallurgie, vol. 13, no. 3, May and June 1919, pp. 63-72. Aluminum paper, aluminum powder, aluminum photo-powders, and uses of aluminum gas industry.

Uses of Aluminum in the Electrical Industry (L'aluminium dans l'appareillage électrique), C. Zetter. Revue générale de l'Électricité, vol. 6, no. 26, Dec. 27, 1919, special supplement, pp. 63-78, 2 figs. Steel, aluminum, duralumin, and brass are compared from viewpoints of initial cost, ease of manufacture and adaptability to electrical uses.

Wastes. A Method of Melting Wastes from Aluminum or Aluminous Alloys (Verfahren zum Zusammenschmelzen von Abfällen aus Aluminium oder aluminiumreichen Legierungen). Metall-Technik, vol. 45, no. 43-44, Nov. 5, 1919, p. 172. As results of experiments, writer recommends use of fluorides of heavy metals either alone or together with salts of the light metals. Those especially recommended are fluorides of zinc, copper, nickel and their double salts or mixture with fluoride of potassium.

Welding. Autogenous Welding of Aluminum (Autogene Aluminiumschweissung), H. Pradel. Elektrotechnischer Anzeiger, vol. 37, no. 30, Feb. 21, 1920, p. 139. Describes process developed by the Griesheim-Elektron chemical factory in Frankfurt, according to which aluminum can be welded in any form as casting, plate or wire with the aid of a liquid for dissolving the aluminum oxide layer.

The "Chill" in Aluminum Welding, David Baxter. Acetylene Jl., vol. 21, no. 5, Nov. 1919, pp. 336-341 and 350-352, 4 figs. Describing method of welding crankcases.

Wire Joints. Investigations of the Size and Durability of Wire Joints with Special Regard to Aluminum (Untersuchungen über die Grösse und Beständigkeit von Kontaktverbindungen unter besonderer Berücksichtigung des Aluminums), Rudolf Richter. Elektrotechnische Zeitschrift, vol. 41, nos. 18, 19, 20, 21, 22 and 23, May 6, 13, 20, 27, June 10, 1920, pp. 345-351, 367-370, 386-392, 409-413, 433-435 and 448-452, 19 figs. Results of investigations extending over 3½ years of 421 screwed, riveted, soldered and twisted joints of aluminum and other metallic wires showed that in every respect satisfactory screw and solder joints between aluminum and other metals are possible; twisted and riveted joints with aluminum are unreliable; position of metals to be joined in the electric contact series has no important bearing on size and durability of the joints.

ALUMINUM ALLOYS

Aeroplane Engine. Aluminium Alloys for Aeroplane Engines, F. C. Lea. Aeronautical Jl., vol. 23, no. 107, Nov. 1919, pp. 545-607, 68 figs. Summary of difficulties which had to be overcome and results achieved in connection with applications of aluminum alloys to construction of aeroplane engines. Lists are given of compositions of various alloys used and apparatus for which each has been employed is indicated. Royal Air Force specifications for aluminum-alloy castings are quoted.

Aluminum Bronze. The Founding of Aluminum Bronze, Charles Vickers. Brass World, vol. 16, no. 8, Aug. 1920, pp. 223-226, 4 figs. Impurities permissible in raw materials. Casting difficulties encountered due to peculiarities of alloy.

Aluminum-Copper. Foundry Methods for Light Aluminum: Copper Alloys, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 735-737. Statement of melting and alloying practice in vogue in America for production of no. 12 alloy, and discussion of apparent advantages and disadvantages in use of copper or various copper-rich hardeners.

Manufacture of Rich Copper: Aluminum Alloys or Hardeners, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 13, Sept. 29, 1920, pp. 617-621, 5 figs. Describes methods in use in aluminum foundries of United States for manufacturing rich alloys of copper and aluminum, and details of experiments carried out for purpose of comparing different methods.

Some Theoretical Principles of Alloying, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 317-320, 6 figs. Discussion of possible applications of such general concepts as may be drawn from equilibrium diagram, heat of alloy formation, thermit reaction, diffusion and solution to problems connected with production of aluminum-copper alloys in the foundry.

See also COPPER ALLOYS, Copper-Aluminum; ELECTRIC FURNACES, Uses.

Aluminum-Magnesium-Copper. Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium with Copper, with Nickel, and with Manganese, F. D. Merica, R. G. Waltenberg and A. N. Finn. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 132, Oct. 25, 1919, 13 pp., 3 figs. Alloys of aluminum-magnesium-copper were found to be superior in all conditions to those of other series in respect to tensile properties.

Ternary Alloys of Aluminum with Magnesium and Copper (Ueber ternäre Legierungen des Aluminiums mit Magnesium and Kupfer), Rudolf Vogel. Zeitschrift für anorganische und allgemeine Chemie, vol. 107, no. 4, July 29, 1919, pp. 265-307, 43 figs., partly on 4 supp. plates. Examination of binary and a number of ternary alloys showed that tendency to binary combinations is very prevalent among metals but that combinations of three metals are less frequent.

Analyses of. Aluminum Alloys New and Old. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 52-53. Analyses of 26 aluminum alloys and their uses are presented.

Bronzes. Further Progress in Ingot Production, Charles Meigh. Metal Industry (N. Y.), vol. 17, no. 12, Dec. 1919, pp. 507-509, 3 figs. Also in Metal Industry (Lond.), vol. 16, no. 4, Jan. 23, 1920, pp. 61-62, 3 figs. Method of casting alloy aluminum bronzes at low temperature with minimum fall and exposure to air, while molten, and automatic feed.

Self-Annealing in Aluminum Bronze, Austin B. Wilson. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 776-778, 9 figs. Results of tests of self-annealed aluminum bronze.

The Still Process for Casting Aluminum Bronze. Metal Industry, vol. 18, no. 3, March 1920, pp. 118-120, 6 figs. Method was devised specially for preventing formation of alumina in aluminum bronze.

Casting Alloys. Some Tests of Light Aluminum Casting Alloys—the Effect of Heat Treatment, P. D. Merica and C. P. Karr. Dept. Commerce, Technologic Papers Bur. of Standards, no. 139, Oct. 24, 1919, 31 pp., 16 figs., partly on supp. plates. Tensile properties and hardness of a number of different compositions of light aluminum casting alloys, comparison of their resistance to corrosion, and determination for a few commonly used compositions of resistance to action of alternating stresses.

Study Common Aluminum Alloys, Robert J. Anderson. Foundry, vol. 47, no. 19, Nov. 15 1919, pp. 827-828. Discussion of relative merits of various aluminum alloys used for casting purposes.

Castings. Blowholes, Porosity, and Unsoundness in Aluminum-Alloy Castings, Robert J. Anderson. Dept. Interior, Bur. Mines, no. 241, 34 pp., 16 figs. It is concluded from results of experimental work, survey of experience of various foundries and examination of current literature, that: (1) Number of blowholes present is directly proportional to pouring temperature, (2) unsoundness varies with temperature to which charge is heated, the higher the temperature the more unsound being the resultant castings, and (3) unsoundness is function of length of time of melting, the longer any melt is held in furnace the more unsound being the castings, irrespective of temperature of heating and pouring temperature.

Duralumin. See DURALUMIN.

Hardness of. Hardness of Certain Aluminum Alloys, R. E. Search. Metal Industry (N. Y.), vol. 18, no. 9, Sept. 1920, pp. 403-405, 6 figs. Compilation of investigations of M. M. Leon Guillet, Jean Durand and Jean Galibourg, from Revue de Metallurgie.

Heat Treatment. Heat Treating of Aluminum Alloys (Traitements thermiques d'alliages d'aluminium), M. Grard. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 571-574, 1 fig. Study of variations of mechanical characteristics in terms of heat treating temperature after rolling and of velocity of cooling after treatment.

Impact Tests. Charpy Impact Test as Applied to Aluminum Alloys, E. H. Dix. Min. & Metallurgy, no. 160, April 1920, p. 31. It is concluded from results of tests at Lynite Laboratories of Aluminum Manufactures, Inc., that Charpy impact resistance of copper-aluminum alloys decreases with increase of copper content.

Industrial Uses. Alloyed Aluminum as an Engineering Material, G. M. Rollason. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 495-500, 11 figs. Traces improvement in development of commercial alloys, presenting in connection therewith photomicrographs on alloys commonly used, discusses subject of casting of aluminum as well as methods employed in both cold and hot rolling of metal, and visualizes possible future uses of aluminum and its various alloys.

Iron, Nickel, Manganese and Antimony. Transformations Experienced by Certain Aluminum Alloys (Sur les transformations subies par certains alliages d'aluminium), Leon Guillet. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1042-1043. Alloys experimented on were: Aluminum-iron with 77.55 per cent iron; aluminum-nickel with 62.52 per cent nickel; aluminum-manganese with 85.4 per cent manganese and aluminum-antimony with 79.86 per cent antimony.

Lynite. Developments in Alloyed Aluminum, R. E. Carpenter. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 86-88, 5 figs. Production of Lynite alloys is recorded, and table of their physical properties is included.

Increasing the Scope of Aluminum Alloys, Ferdinand Jehle. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1025-1027, 5 figs. Properties of aluminum alloys developed during war, specially Lynite alloys.

Micrography of. Micrography of Aluminum Alloys, L. J. Wills. Metal Indus., vol. 15, no. 21, Nov. 21, 1919, pp. 432-434. Report of lecture before Birmingham Metallurgical Soc.

Nickel Plating. Nickel Plating of Aluminum and Its Alloys (Sur le nickelage de l'aluminum et de ses alliages), Léon Guillet and Maxime Gasnier. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 21, May 25, 1920, pp. 1253-1256. Following procedure is reported to have proved successful: Scraping of metal by sand jet under pressure of 1500 gr. per sq. in. nickel-plating for one-half hour under 0.8 amp. per sq. dm.; copper-plating for 2 hours under 1 amp. per sq. dm.; polishing of copper surface; nickel plating for 1 hour under 0.5 amp. per sq. dm.; and final polishing of surface.

Reflective Properties of. Preparation and Reflective Properties of Some Alloys of Aluminum with Magnesium and with Zinc. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 363, Feb. 12, 1920, pp. 653-657, 1 fig. Alloys of aluminum with magnesium and with zinc are not considered suitable for mirrors where permanency is of prime importance, but it is said that Al_3Mg_4 deteriorates less rapidly than any other alloy examined and could be used in apparatus where highly reflecting mirror is desired for a short time.

Specific Gravity and Composition. The Relationship Between Specific Gravity and Composition of Light Aluminium Alloys, B. W. Hales. Engr., vol. 129, no. 3357, April 30, 1920, pp. 439-440, 2 figs. Results of comparative tests. Reference is made to paper by Rhodin read before Faraday Soc. in July 1918.

Uses. Increasing Use of Alloyed Aluminum as an Engineering Material, G. M. Rollason. Indus. Management, vol. 59, no. 5, May 1920, pp. 387-390, 9 figs. Properties of aluminum and aluminum alloys are given, and their recent uses are pointed out, particularly in automobile industry. Paper read before New York Section, Am. Soc. M. E.

Uses in Automotive Industry. Aluminum Alloys, Zay Jeffries. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 295-299 and p. 305, 14 figs. Effect of aluminum alloying on its physical properties, and uses of aluminum alloys in automotive industry.

Zinc-Aluminum-Copper. See ZINC ALLOYS, Zinc-Aluminum-Copper.

ALUNITE

Analysis and Testing of. Alunite, Edward S. Simpson. Cement, Mill & Quarry, vol. 16, no. 9, May 5, 1920, pp. 35-36. Gives analysis of mineral and describes simple methods of testing and treating it.

AMALGAMS

Vapor Pressure of. The Vapor Pressures of Cadmium, Lead and Tin Amalgams, Joel H. Hildebrand, A. H. Foster and C. W. Beebe. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 545-548, 2 figs. Vapor pressures of mercury over amalgams of cadmium, lead and tin at 324 deg. were measured at intervals covering entire range of concentrations. Values of constants in empirical equation relating vapor pressure to composition are given for each amalgam.

[See also ALLOYS, Amalgams.]

AMALGAMATION

See GOLD METALLURGY, Amalgamation.

AMATOL

See EXPLOSIVES, Manufacture.

AMERICAN EXPEDITIONARY FORCES

Construction and Forestry Work. Engineer Construction in France, J. A. Woodruff. Military Engr., vol. 12, no. 61, Jan.-Feb. 1920, pp. 1-8 and 49-60 and (discussion) pp. 60-67, 26 figs.,

2 on supp. plate. Account of work of the Division of Construction and Forestry, A.E.F.

Ordnance Machine Shops. See ORDNANCE MACHINE SHOPS, A.E.F., France.

Radiotelegraphy. See RADIOTELEGRAPHY, American Expeditionary Forces.

Railway Shop, France. See INDUSTRIAL MANAGEMENT, Scheduling and Routing.

Water Supply. See WATER SUPPLY, A.E.F.

Welding Work. See OXY-ACETYLENE WELDING, A.E.F., France.

[See also TERMINALS, RAILWAY, A.E.F., France.]

AMERICANIZATION

See INDUSTRIAL RELATIONS, Americanization.

AMINO ACIDS

Determination by Hydrogen Electrode. A Study of the Determination of Amino Acids by Means of the Hydrogen Electrode, E. L. Tague. Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 173-184, 2 figs. Explains adaptation of electrometric titration method by means of which it is possible to obtain neutralization curves of amino acids alone.

AMMETERS

British Specifications for. British Standard Specification for Indicating Ammeters, Voltmeters, Wattmeters, Frequency and Power-Factor Meters. British Eng. Standards Assn., no. 89, Oct. 1919, 24 pp., 3 figs. Specifications include both indicating and graphically recording instruments.

British Standard Specification for Recording (Graphic) Ammeters, Voltmeters and Wattmeters. British Eng. Standards Assn., no. 90, Oct. 1919, 14 pp., 1 fig. Limits of error vary from 1.5 to 2.5 per cent of maximum scale value for voltmeter. Corresponding figures for ammeter and wattmeter are 3 to 3.5 per cent respectively.

Splitdorf. Steps in Making an Aluminum Moving Coil for an Ammeter, K. H. Condit. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1055-1056, 4 figs. Discussion of moving coil of Splitdorf meter with illustrations of various stages in transformation of an aluminum disk into finished coil.

AMMONIA

By-Product, Manufacture of. By-Products in 1919. Colliery Guardian, vol. 120, no. 3110, Aug. 6, 1920, pp. 377-379. Report of chief inspector of alkali works. It deals with methods of manufacture, and quantities and qualities of ammonia products manufactured in England.

Cyanamide as Source. The Question of Nitrogen (La question de l'azote). Journal des Usines à Gaz, vol. 43, no. 19, Oct. 5, 1919, pp. 295-298. Serpak process for transforming cyanamide into ammonia.

Cyanides as Source. The Production of Ammonia and Formates from Cyanides, Ferrocyanides, and Cyanized Briquets, G. W. Heise and H. E. Foote. Jl. Indus. & Eng. Chem., vol. 12, no. 4, Apr. 1920, pp. 331-336, 2 figs. Good yields of ammonia were obtained from sodium cyanide by steaming at 50 lb. pressure. Quantitative yield was obtained at 200 lb. With cyanized briquets yields averaging over 90 per cent were obtained in 30 to 45 min. by steaming at 300 to 330 lb.

Cyanogen Compounds in. The Estimation of Cyanogen Compounds in Concentrated Ammonia Liquor. The Estimation of Thiocarbonate, Percy Edwin Spielmann and Henry Wood. Jl. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 369T-370T. Colorimetric method outlined in Jl. of Soc. of Chem. Indus., 1919, pp. 38T-43T, extended to include determination of thiocarbonate.

Gas Equilibrium. See Synthesis of.

German Industry. The Present Status and Future Development of the Ammonia Industry (Die derzeitige Lage und künftige Entwicklung auf dem Ammoniakmarkt), H. Bueb. Jl. für Gasbeleuchtung, vol. 62, no. 46, Nov.15, 1919, pp. 677-679 and (discussion) pp. 679-682. Author relates how importance of production of artificial fertilizer from nitrogen was demonstrated during war, and calls attention to syndicate formed by the five greatest German plants for the production of nitrogen, for purpose of increasing production, standardizing price and regulating distribution.

Manufacture of. The Consumption of Steam in the Precipitation of Ammonia from Calcium Cyanamide (Ueber den Dampfverbrauch bei der Abspaltung von Ammoniak aus Kalkstickstoff), Julius Baumann. Chemiker-Zeitung, vol. 44, no. 46, Apr. 15, 1920, pp. 293-294. Describes method by which, it is claimed, 60 per cent of steam consumed by the described individual drive can be saved.

Mollier Diagram for. See REFRIGERATING PLANTS, Ammonia in Circulation.

Oxidation. Catalytic Oxidation of Ammonia (Étude de l'oxydation catalyique de l'ammoniaque), Paul Pascal and Eugène Decarrière. Bulletin de la Société chimique de France, vol. 25 and 26, no. 9, Sept. 1919, pp. 489-507, 7 figs. Experimental study made by varying form of catalytic agent, temperature of reaction, duration of contact and composition of gaseous mixtures submitted to catalysis.

The Catalyst for the Oxidation of Ammonia, G. A. Perley. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 125-129. Use of suitably preheated air-ammonia mixture is pointed out as most important for production of sufficiently high temperature for rapid reaction velocity of desired reaction. It is believed that use of platinum gauze of 0.0025 in. diameter wire and 120 to 150 mesh is more convenient than one of 80 mesh because it decreases free gas space between wires.

The Catalytic Oxidation of Ammonia to Nitric Acid (Die katalytische Oxydation des Ammoniaks zu Salpetersäure), Bernhard Neuman and Herta Rose. Zeitschrift für angewandte Chemie, vol. 33, nos. 14, 16 and 18, Feb. 1, 24 and Mar. 2, 1920, pp. 41-44, 45-48 and 51-55, 11 figs. Results of experiments with various contact substances, such as platinum, ferric oxide mixtures and oxides of chromium, copper and vanadium are given and compared with results obtained by other investigators. Based on resultant determination of gas composition, reaction temperature for certain gas mixtures is calculated and it is shown that under certain conditions the continuous transformation of ammonia into nitric oxide is technically possible without addition of external heat. Report from Inst. for Chem. Technology of Technical High School at Breslau.

The Commercial Oxidation of Ammonia, George Arthur Perley. Jl. Indus. & Eng. Chem., vol. 12, nos. 1 and 2, Jan. and Feb. 1920, pp. 5-16 and 119-129, 5 figs. Jan.: Survey of work done by various investigators, especially at Bur. of Mines. Feb.: Factors involved in choice of commercial catalyst for use in oxidation of ammonia.

The Oxidation of Ammonia, W. S. Landis. Thirty-fifth General Meeting of Am. Electrochem. Soc., Apr. 3, 1919, pp. 283-303, 4 figs. Historical account of development of various processes.

The Oxidation of Ammonia (Zur Ammoniak-

Oxydation), Julius Baumann. Chemiker-Zeitung, vol. 44, no. 21, Feb. 17, 1920, pp. 145-146. Writer states process may be worked out according to two equations and gives thermal calculation of both equations.

Separation from Pyridine. Pyridine and Ammonia, Estimation and Separation—An Application of the Electrolytic Dissociation Theory, E. B. R. Prideaux. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 137-147, 1 fig. Information as to conditions for titration of pyridine and of ammonia in presence of pyridine, and of separation of the two by distillation, is deduced from electro-chemical theory.

Synthesis. An Electrically Heated Bomb for Ammonia Synthesis, R. O. E. Davis and Harry Bryan. Jl. Indus. & Eng. Chem., vol. 12, no. 3, Mar. 1920, pp. 287-288, 3 figs. Type used at Bureau of Soils, Department of Agriculture, Washington, D. C.

Computations of the Equilibrium of Ammonia Gas (Berechnungen zum Ammoniakgasgleichgewicht), Edward Maurer. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 4, Oct. 24, 1919, pp. 273-302, 6 figs. Tables of computations worked out by writer are compared with those of von Haber. It is remarked that Haber's figures of percentage content of ammonia in equilibrium in the order of their magnitude, which were regarded by many as astonishing at the time of their publication (Zeitschrift für Elektrochemie, 1914, p. 603), have been fully confirmed by the Jost figures; but that figures obtained by Jost in Nernst Laboratory sufficiently demonstrate that technical synthesis of ammonia is scientifically confirmed.

Direct Synthesis of Ammonia by Catalysis Under Pressure (Contribution a l'étude de la synthèse directe de l'ammoniac par catalyse sous pression), Marcel Guichard. Bulletin de la Société d'Encouragement pour l'Industrie National, vol. 132, no. 1, Jan.-Feb. 1920, pp. 71-102, 22 figs. Over 400 catalyzers were experimentally studied. From data obtained and analytical consideration, gaseous cycle is formulated for determining best conditions of industrial synthesis of ammonia.

Industrial Employment of Extremely High Pressures. Sci. Am. Monthly, vol. 1, no. 6, June, 1920, pp. 511-512. Advantages of using pressures of only 200 atmos. in making synthetic ammonia are pointed out. Translated from Comptes rendus des Séances de l'Académie des Sciences.

Industrial Synthesis of Ammonia by Georges Claude Process (La synthese industrielle de l'ammoniac par le procédé Georges Claude), Jacques Boyer. La Nature, nos. 2397 and 2398, April 10, 1920, pp. 151-156, 7 figs. Method at Montereau works, France.

Procuring Saltpeter and Ammonium Sulphate from Potash Salts. New Process for the Synthesis of Ammonia (Die Gewinnung von Kalisalpeter und Ammoniumsulfat aus Kalirohsalzen, neue Wege zur Bindung von Ammoniak), Heinrich Hampel. Chemiker-Zeitung, vol. 43, nos. 113 and 115, Sept. 18 and 23, 1919, pp. 617-619 and 634-636, 2 figs. Describes apparatus used for this purpose by which, it is said, the technical carrying out of process is very much simplified. Table and curve showing costs of raw material per kg. nitrogen necessary for synthetic process.

Purification of Compressed Gases in Testing Catalysts for Ammonia Synthesis, R. O. E. Davis. Jl. Indus. & Eng. Chem., vol. 12, no. 3, Mar. 1920, pp. 289-290, 3 figs. Method used at Arlington, Va., plant, in work on synthesis of ammonia carried on in coöperation with Bureau of Soils, Department of Agriculture and Nitrate Division of War Department.

Synthesis of Ammonia at High Pressures. Chem. Age (Lond.), vol. 3, no. 57, July 17, 1920, pp. 56-59, 7 figs. General description of Georges Claude process, which is in operation at Montereau, France.

Synthesis of Ammonia at Very Higgh Pressures (Sur la synthèse de l'ammoniac aux pressions très élevées), Georges Claude. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1039-1041, 1 fig., and vol. 170, no. 3, Jan. 19, 1920, pp. 174-177. Dec. 1, 1919: Conditions of equilibrium deduced from reaction $N_2 + 3\,H_2 = 2\,N\,H_3$. Jan. 3, 1920: Writer claims increase of pressure from 200 to 1000 atmospheres is justifiable from technical standpoint.

The Direct Synthetic Ammonia Process, R. S. Tour. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 844-852, 7 figs. General outline of process as developed by Fritz Haber, of Karlsruhe, Germany, and C. Bosch, of Hadische Anilin und Soda Fabrik of Ludwingshafen, Germany.

The Synthesis of Ammonia, E. B. Maxted. Chem. Age, vol. 1, no. 19, 20 and 22, Oct. 25, Nov. 1 and 15, 1919, pp. 514-515, 540-542 and 590-592, 1 fig. Relation between direct synthesis of ammonia and alternative methods of nitrogen fixation are discussed from economic standpoint. Technology of process.

Vapor Pressure of. The Vapor Pressure of Ammonia, C. S. Cragoe, C. H. Meyers and C. S. Taylor. Sci. Papers Bur. Standards, no. 369, Apr. 10, 1920, 35 pp., 7 figs.; also in A.S.R.E. Jl., vol. 6, no. 5, Mar. 1920, pp. 307-343, 8 figs., and in Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 206-229, 6 figs. Detailed description is given of apparatus and method employed in present measurements throughout temperature interval —78 deg. to +70 deg. Normal boiling point of ammonia determined by static and also dynamic method, the mean of results of two methods being —33.35 deg. Article contributed by Bur. of Standards.

AMMONIA COMPRESSORS

Direct-Connected. Direct Connected Compressors, C. N. Drake. Ice & Refrigeration, vol. 58, no. 5, May 1920, pp. 267-268. Advantages quoted for direct-connected synchronous motor drive for ammonia compressors are: (1) higher motor efficiency, (2) elimination of belts and transmission losses, (3) high power factor with consequent lower power rates, and (4) saving in floor space.

English. Some Profitable Reflections for the Intending Purchaser of Ammonia Refrigerating Plant, Leuig Chew. Cold Storage & Ice Assn., vol. 16, no. 2, 1920, pp. 35-58 and (discussion), pp. 59-68, 6 figs. on 5 supp. plates. Improvements in design and construction of ammonia compressors which are outcome of recent experimental work and comparative tests carried out by H. J. West & Co., England, and other manufacturers.

Vilter High-Speed. Two New Vilter High-Speed Ammonia Compressors. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 804-806, 6 figs. Double trunk piston with piston rings to stop both ammonia and oil is fitted to guard against oil getting past piston and draining crankpit.

AMMONIUM ACID FLUORIDE

Titration. The Titration of Ammonium Acid Fluoride, Wallace S. Chase. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 567-568. Method is outlined which depends on removal of hydrofluoric acid and titration of equivalent hydrochloric acid liberated, thereby permitting use of one of common indicators.

AMMONIUM NITRATE

Freezing Point. The Properties of Ammonium Nitrate—Part I. The Freezing Point and Transition-Temperatures, Reginald George Early and Thomas Martin Lowry. Jl. Chem. Soc., vols. 115 & 116, no. 686, Dec. 1919, pp. 1387-1404. It is said that by careful purification and drying, freezing point of ammonium nitrate has been raised to 169.6 deg. cent. Highest of transition points was determined from arrests of temperature on heating and cooling salt when suspended in liquid of similar density. Temperatures recorded were: On heating, 125.24 deg. cent.; on cooling, 125.19 deg. cent.; mean value, 125.2 deg. cent. Lowest transition temperature was fixed at 32.1 deg. cent.

AMMONIUM OXALATE

See SODIUM OXALATES.

AMMONIUM SULPHATE

Caking of. The Caking of Sulphate of Ammonia, C. G. Atwater and J. F. W. Schulze. Chem. & Met. Eng., vol. 22, no. 7, Feb. 25, 1920, pp. 373-374. Account of experimental investigation made to determine caking tendency of sulphate of ammonia when stored in bags or in a pile.

AMMUNITION

Artillery. See ARTILLERY, Ammunition.

French High-Explosive. Report of Test of French 37 M/M High Explosive Ammunition. Air Service Information Circular, vol. 1, no. 19, May 5, 1920, 10 pp., 7 figs. Object of test was to determine destructive effect of 37 m/m high explosive ammunition equipped with supersensitive fuse.

Service in A.E.F. Ammunition Service in the A.E.F., Philip H. Worcester. Jl. U. S. Artillery, vol. 53, no. 1, July 1920, pp. 9-48, 13 figs. Means, methods and regulations used overseas in supply of ammunition to firing batteries of the front from ammunition stocks of rear.

[See also ARTILLERY, Ammunition; BULLETS.]

AMPLIFIERS

See RADIOTELEGRAPHY, Amplifiers; VACUUM TUBES, Amplifiers.

AMPULS

See GLASS, Ampuls.

ANEMOMETERS

Direct-Reading. Direct-Reading Anemometer for Mines, J. T. M'Gregor-Morris. Coal Industry, vol. 3, no. 10, Oct. 1920, pp. 478-479, 3 figs. Describes a portable machine for measuring the air in mines, which is direct reading, and illustrates advantages and accuracy of instrument. Paper read before Cardiff meeting of British Assn.

Electrical Oscillation. Anemometer Operating by Electrical Oscillations (Sur un anémometre à oscillations électriques), M. E. Rothé. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 20, May 17, 1920, pp. 1197-1198. Fan of anemometer operates as interrupter and at each contact sets electrical vibrator in action.

Hot-Wire. A Directional Hot-Wire Anemometer of High Sensitivity, Especially Applicable to the Investigation of Low Rates of Flow of Gases, J. S. Thomas. Proc. Physical Soc. of Lond., vol. 32, part 3, April 15, 1920, pp. 196-207, 3 figs. Instrument consists of two fine platinum wires mounted close together, and forming two of arms of Wheatstone bridge. These are heated by current in bridge. When a stream of gas moves in direction perpendicular to wires, but parallel to plane containing them, leading wire is cooled, while second wire, being shielded by first, is not cooled as much, and may be heated by air flowing past it being warmed by first wire. Deflection of galvanometer is obtained, which is reversed if flow of gas is in reverse direction.

Variation in Readings. Variation Produced by Inclination of Wind in the Readings of Robinson and Richard Anemometers (Sur la variation des indications des anémomètres Robinson et Richard en fonction de l'inclinaison du vent), C. E. Brazier. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 10, March 8, 1920, pp. 610-612. Results of experiments made at aerodynamic laboratory.

ANILINE

Estimation of. The Estimation of Aniline in Commercial Anilines, W. J. Sanderson and W. J. Jones. Jl. Soc. Chem. Industry, vol. 39, no. 1, Jan. 15, 1920, p. 8T. Method depending on relation between freezing point of sample and its aniline content.

ANNEALING

Phenomena of. The Phenomena of Annealing, Herbert Sterling Wilson. Jl. Am. Steel Treaters Soc., vol. 2, no. 5, Feb. 1920, pp. 218-222 and (discussion) pp. 222-226. To intelligently soften or anneal, writer claims it is necessary to understand what has gone before—whether hardened by chilling or by condensation, what kind of alloy, if any, amount of carbon present, and if possible, temperature at which chilling has taken place.

ANNEALING OVENS

Continuous. New Annealing Oven Saves Heat. Foundry, vol. 48, no. 351, July 15, 1920, pp. 569-570, 3 figs. Continuous tunnel kiln having double chambers with a common wall between is said to reduce radiation surface. Cold cars enter one chamber and absorb heat of cars coming from opposite chamber.

ANTENNÆ

See RADIOTELEGRAPHY, Antennæ.

ANTI-AIRCRAFT GUNS

See ARTILLERY, Anti-Aircraft.

ANTIMONY

Consumption by Industries. Antimony—Production, Markets and Uses. Raw Material, vol. 2, no. 4, April 1920, pp. 153-159, 5 figs. Tables are included indicating antimony consumption by industries, and antimony contents of alloys used for type metal, linotype metal, Britannia metal, etc. It is said that during June 1918 about 3,600,000 lb. of antimonial material was used by various industries in United States.

Crystalline Structure. The Crystalline Structure of Antimony, R. W. James and Norman Tunstall. London, Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, no. 236, Aug. 1920, pp. 233-239, 2 figs. Observations are related from which it appears that assumption for antimony of structure similar to that of diamonds (see Philosophical Mag. 1914, p. 224) will not explain spectra observed from various phases of crystalline structure.

Magnetic Susceptibility. The Magnetic Susceptibility of Antimony and Bismuth—A Contribution to the Study of Magnetons (Die magnetische Suszeptibilität von Antimon und Wismuth; ein Beitrag zur Kenntnis der Form der Magnetonen), Héctor Isnardi and Richard Gans. Annalen der Physik, vol. 61, no. 7, Apr. 15,

1920, pp. 585-590, 5 figs. Results of measurements show that magnetic susceptibility is not dependent on strength of field. Comparison with the Gans theory shows that the main moments of inertia of a magneton coincide with one another. Report from Physical Inst. of La Plata, Argentine.

Production in France. Antimony Before, During and Since the War (L'antimoine avant, pendant et après la guerre), L. Campredon. Métallurgie, vol. 52, no. 2, Jan. 14, 1920, pp. 107-108. Statistics of production in France.

APPRAISAL

Gas Properties. Appraisal of Gas Property for Rate Making, Frank Batt. Gas Age, vol. 44, no. 12, Dec. 15, 1919, pp. 538-541. Discussion of methods used by Ill. Public Utilities Commission and suggestions as to how managers may make their own appraisals.

Methods. Appraisal and Valuation Methods, David H. Ray. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 931-936, 6 figs. Writer points out need of engineer's entering appraisal field, particularly because he is likely to be more familiar with cost and value of materials, machines and structures than lawyer or accountant. Writer also defines terms used in appraisal work and emphasizes desirability of giving a value to a machine as a unit, of grouping of similar tools, and of use of symbols in forms of numbers and letters in tagging materials to be appraised.

Normal Value in. "Normal" Value in Appraisals, Cecil F. Elmes. Eng. & Contracting, vol. 53, no. 3, Jan. 21, 1920, pp. 66-70, 4 figs. Charts representing average cost of various basic commodities for a number of years are presented and question of determining from them average value of each commodity is discussed. Paper read before Ill. Gas Assn.

Used Machine Tools. Practical Methods of Appraisal, L. L. Thwing. Am. Mach., vol. 52, no. 26, June 24, 1920, pp. 1355-1357. Author gives results of his experiences in appraisal of used machine tools.

Valuation and. Appraisal and Valuation of Properties. Mech. Eng., vol. 42, no. 10, Oct. 1920, pp. 549-561 and p. 597. Symposium at St. Louis meeting of Am. Soc. Mech. Engrs. Papers given are: Rational Valuation—A Comparative Study, James Rowland Bibbins; Price Levels in Relation to Value, Cecil F. Elmes; The Cost of Organizing and Financing a Public-Utility Project, F. B. H. Paine; The Construction Period, H. C. Anderson.

APPRENTICES, TRAINING OF

Electric Welders. Training Electric Welders. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1142-1145, 4 figs. Methods used by General Electric Co., Schenectady, N. Y., in training operators of electric welding equipment.

Ford Motor Co. Training 300 Apprentice Die-Makers with One Instructor, Norman G. Shidle. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 472-475, 6 figs. Course given at plant of Ford Motor Co.

Foundry. Training Men for Foundry Duties, C. C. Schoen. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp. 59-61. Claims that existing conditions in foundry labor demand more general use of short time training systems for apprentice labor and unskilled help.

French Railway Shops. Reorganization of Training of Apprentices at the Shops of the Orleans Railway (Réorganisation de l'apprentissage à la compagnie du Chemin de Fer d'Orléans), M. Chassagne. Revue générale des Chemins de Fer, vol. 39, no. 8, Aug. 1920, pp. 39-59, 8 figs. Developments during war.

Santa Fe System. The Santa Fe Apprentice System, F. W. Thomas. Jl. Western Soc. of Engrs., vol. 25, no. 11, July 20, 1920, pp. 404-410. History of introduction and details of organization of system for training of employees in the railway shops.

Schools for. The Advantages of an Efficient Apprentice School. Eng. and Indus. Management, vol. 4, no. 2, July 8, 1920, pp. 46-47. How Greenfield Tap and Die Corporation, Greenfield, Mass., makes its apprentice school self-supporting.

The Production and Instruction in an Apprentice School, Peter F. O'Shea. Am. Mach., vol. 52, no. 10, March 4, 1920, pp. 505-508, 3 figs. Apprentice school of Greenfield Tap and Die Corporation.

Systems of Instruction. Programs of Apprenticeship and Special Training in Representative Corporations, J. V. L. Morris. Am. Mach., vol. 53, nos. 13, 15 and 17, Sept. 23, Oct. 7 and Oct. 21, 1920, pp. 565-568, 657-659 and 765-766, 15 figs. Sept. 23: System in use in Schenectady plant of General Electric Company. Oct. 7: System in use in plant of R. Hoe & Co., New York. Oct. 21: System of instruction given to trades apprentices and machine specialists by Mergenthaler Linotype Co., Brooklyn, N. Y.

Willys-Overland System. Successful Substitute for Apprenticeship. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 746-748, 3 figs. System of labor-training developed by Willys-Overland Co., Toledo, Ohio, which keeps the "improvers," as men taking course of training are called, engaged upon regular lines of production work. How system is applied.

AQUEDUCTS

Apulian, Italy. The Apulian Aqueduct, Italy (L'Acquedotto dell Puglie), Luigi Luiggi and Raffaele Tramonte. Giornale del Genio Civile, vol. 58, Mar. 31, 1920, pp. 117-180, 115 figs., 69 on 12 supp. plates. Total length of main conduit is 992 miles, and present delivery about 194 cu. ft. per sec. There are 152 reservoirs containing about 10,250,000 cu. ft. of water, and serving a scattered population of 2,200,000.

The Completion of the Apulian Aqueduct (L'achèvement de l'aqueduc des Pouilles). Génie Civil, vol. 77, no. 5, July 31, 1920, pp. 91-95, 11 figs. Total length of main conduit is 992 miles, and present delivery about 194 cu. ft. per sec. There are 152 reservoirs containing about 10,250,000 cu. ft. of water, and serving a scattered population of 2,200,000.

Catskill. See WATER SUPPLY, Catskill Aqueduct.

Reinforced-Concrete. The Construction of the Pouilles Aqueduct (L'achèvement de l'aqueduc des Pouilles). Génie Civil, vol. 77, no. 6, Aug. 7, 1920, pp. 105-109, 13 figs. Details of reinforced-concrete siphons.

San Francisco Water Supply. Hetch Hetchy Water Supply. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 165-167, 3 figs. Details of 154-mile aqueduct and auxiliaries for ultimate delivery of 400,000,000 gal. daily to San Francisco at estimated cost of $45,000,000. Description of Hetch Hetchy railroad, 68 miles long, built by city of San Francisco.

ARCHES

Concrete. Truss Centering Used for 113-Ft. Concrete Arch, C. B. McCullough. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 851-852, 3 figs. Timber Howe truss adopted instead of false-work because of depth of water in channel of Rogue River Bridge, Oregon.

Design. Direct Determination of the Moment In-

fluence Lines of the Fixed-Ended Arch (Direkte Ermittlung der Momenteneinflusslinien des Eingespannten Bogens), Josef Vincenz. Armierter Beton, vol. 12, no. 12, Dec. 1919, pp. 309-313, 4 figs. Account of what is said to be a simpler and more reliable method with which same result as with customary graphic method can be reached by the drawing of a single funicular polygon with corresponding elastic loads.

Influence Lines Applied to Arch Design, G. R. Magnel. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 843-846, 6 figs. Exemplifies method of plotting influence lines for designing arch to withstand rolling loads.

Parabolic Elastic. Rapid Calculation of Deflecting Moments in Parabolic Elastic Arch (Cálculo rápido de momentos flectores en el arco elástico parabólico), Cesar Chiodi. Revista del Centro de Estudiantes de Ingenieria, no. 203, May 1919, pp. 532-542, 8 figs. Graphs are given for determination of K and R.

Reinforced-Concrete. Novel Concrete Arches for Garage Roof Supports, G. E. Warren. Concrete, vol. 16, no. 5, May 1920, pp. 210-212, 7 figs. Span width of each of arches is 103 ft. 7½ in. over all.

Study of a Reinforced-Concrete Arch (Estudo de um arco de concreto armado), Machado de Costa. Boletin do Instituto de Engenharia, vol. 2, nos. 6 and 7, April and Aug. 1919, pp. 355-369 and 391-420, 8 figs. General theory of stresses is first presented and its application is subsequently illustrated by working out design of arch of 150-ft. span.

Skew, Design of. The Static Calculation of Skew Three-Hinged Arch Spans (Die statische Berechnung schiefer Dreigelenkgewölbe), Walter Nakonz. Zeitschrift für Bauwesen, vol. 70, no. 4-6, 1920, pp. 358-383, 17 figs. The usual approximative method by which a skew three-hinged arch is investigated in the same manner as a statically determinate straight one gives practical results for the measurement of the shape and strength of arch. The greater the skew of arch the more closely it resembles the fixed arch in its dependence on the quality of the foundation.

[See also TUNNELS, Arches in.]

ARGON

Latent Heat of. Experiments with Reduction of Pressure, Density and Latent Heat of Argon According to Crommelin (Versuche über Druckabfall, Dichte und Verdampfungswärme des Argon nach Crommelin). Zeitschrift für Sauerstoffund Stickstoff-Industrie, vol. 11, nos. 21-22, Nov. 1919, pp. 81-83. It is concluded that 70 kg-cal. is a fairly reliable mean value of the latent heat of argon and that the value of 35 kg-cal. computed by Crommelin is undoubtedly much too low. Report from the Physical Experimental Laboratory in Leiden.

ARITHMOMETER

See ADDING MACHINES, Electric.

ARMATURES

See ELECTRICAL MACHINERY, Dipping and Baking Coils.

ARMORIES

Lighting. See LIGHTING, Armories and Gymnasiums.

ARMY

See U. S. ARMY.

ARMY CAMPS

Sewerage. See SEWAGE DISPOSAL, Army Camps.

ARMY SUPPLY BASES

New Orleans, La. The United States Army Supply Base, New Orleans, La., A. Pearson Hoover. Am. Architect, vol. 116, no. 2292, Nov. 26, 1919, pp. 669-680, 29 figs. Base is composed of three reinforced-concrete buildings, each 600 ft. long, 140 ft. wide and six stories in height, and two-story steel and pile wharf and wharfhouse 2000 ft. long and 140 ft. wide with connecting bridges joining wharfhouse with warehouse units.

Philadelphia. Equipment of Army Supply Base at Philadelphia. Elec. Rev. (Chicago), vol. 76, no. 18, May 1, 1920, pp. 715-718, 8 figs. Electrical equipment of piers and warehouses to be used as loading station. Includes electrically operated cranes, electric trucks for moving traffic and electrically operated elevators.

Planning and Progress on a Big Construction Job, Charles Penrose. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 627-633, 6 figs. How charts kept during building of Philadelphia army base showed performance in various details of engineering work.

New Terminal at Philadelphia. Mar. Rev., vol. 50, no. 6, June 1920, pp. 347-350, 9 figs. Modifications effected to meet commercial needs.

See also TERMINALS, MARINE, Philadelphia Army Base.

ARSENIC

Manufacture. The Manufacture of White Arsenic, E. C. Williams. Eng. and Min. Jl., vol. 110, no. 14, Oct. 2, 1920, pp. 671-673, 1 fig. Details of experimental work carried on in effort to obtain dense white product free from antimony and lead. Proper draft regulation and deep cooling chambers found essential.

Production in 1919. See MANGANESE, Production in 1919.

ARTIFICIAL LIMBS

Gait with. How Men Walk With Artificial Legs, R. du Bois-Reymond. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 36-39, 21 figs. Instantaneous photographs of pulsating lights produced by Geissler tubes attached to legs of walking person. Difference between natural gait and that of a cripple is illustrated with photogrammetric diagrams. Translated from Zeitschrift des Vereines deutscher Ingenieure.

ARTILLERY

Ammunition. Modern Artillery Ammunition, H. M. Brayton. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 95-101, 4 figs. Study of calculation involved in modern artillery ammunition and description of developments during war at Frankford Arsenal.

Anti-Aircraft. Anti-Aircraft Artillery, R. L. Goetzenberger. Jl. Engrs. Club of Phila., vol. 37-9, no. 189, Sept. 1920, pp. 358-363. Defenses of region of Paris. Prospectus of science of anti-aircraft gunnery.

Big Guns, Life of. The Death of a Big Gun, Arthur Benington. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 33-35, 4 figs. Theories accounting for hardening and cracking of rifled surface. From book on artillery by Admiral Ettore Bravetta of Italian navy.

Caterpillar Traction of Heavy Guns. Artillery Motorization as Related to Caterpillar Traction, George W. Dunham. Jl. Soc. Automotive Engrs., vol. 6, no. 3, Mar. 1920, pp. 161-173, 21 figs. Progress in design of caterpillar vehicles by Ordnance Department during war is recorded and lines are indicated along which further improvement may be effected. Opinion is expressed that greater speed ranges for heavy-duty purposes can be obtained by using light track shoes and very small amount of

unsprung weight, embodying use of considerable quantity of rubber or other cushioning medium in connection with rolling members and track.

Equipment Used by A. E. F. Types of Artillery Equipment Used by the American Expeditionary Forces in France with a Brief Discussion of Their Uses and the Reasons for Their Adoption, C. C. Williams. Jl. Franklin Inst., vol. 190, no. 3, Sept. 1920, pp. 301-321, 22 figs. Artillery used was by far of French type. Guns of British type were procured for purpose of utilizing available manufacturing capacity in Great Britain. For purpose of facilitating supply, American types were abandoned.

Fire Observation. See AEROPLANES, Artillery Fire Observation.

French Mapping Methods. See MAPPING, French Artillery Methods.

German Long-Range Gun. The German Long-Range Gun, H. W. Miller. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 89-100, 25 figs. Account of German super-gun bombardment of Paris from Forest of Gobain, 70 miles distant, in spring of 1918, together with authentic details regarding design of gun, carriage, emplacement and projectile.

Mechanical Equipment. The Development of Artillery During the War, M. E. de Jarny. Soc. of Engrs., Jl. and Trans., vol. 10, no. 8, 1919, pp. 221-238 and (Discussion) pp. 239-246, 17 figs. Emphasizes overwhelming importance of mechanical equipment.

Railway. An Emergency Switch for Railway Artillery, John M. Meneely. Jl. U. S. Artillery, vol. 51, no. 6, Dec. 1919, pp. 579-583, 2 figs. For leaving in minimum of time any main line track at any place without actually cutting tracks.

German Railroad Artillery on Belgian Coast, Donald Armstrong. Jl. U. S. Artillery, vol. 51, no. 6, Dec. 1919, pp. 573-577, 3 figs. Of various systems used by Germans on western front, fixed concrete platform is believed to represent best solution of coast defense problem.

Railway Artillery in France, Sanderford Jarman. Nat. Service, vol. 7, no. 3, Mar. 1920, pp. 139-147, 4 figs. Account of organization and activities of Railway Artillery Reserve, American Expeditionary Forces.

Railway Clearances for Railway Artillery, E. D. Campbell. Jl. U. S. Artillery, vol. 52, no. 2, Feb. 1920, pp. 147-152, 4 figs. Composite clearance diagrams of various railway systems, prepared by Ordnance Department.

The Function and Use of Railway Artillery, E. J. Cullen. Jl. U. S. Artillery, vol. 53, no. 3, Sept. 1920, pp. 271-285 and (discussion) pp. 286-289. Discussion of necessary types of railway armament and selection of locations for railway artillery positions.

Traction on Steep Gradients by Supplementary Adherence (La traction sur fortes rampes par adhérence supplementaire), Ch. Dantin. Génie Civil, vol. 75, no. 21, Nov. 22, 1919, pp. 501-506, 13 figs., partly on supp. plate. Hanscotte system of towing artillery trains.

Range Finders. The Manufacture of Artillery Range Finders, George H. Thomas. Am. Mach., vol. 52, nos. 5, 6, 7 and 23, Jan. 29, Feb. 5 and 19 and Dec. 18, 1920, pp. 249-254, 18 figs.; 301-304, 8 figs., 403-404 and 1045-1047, 8 figs. Jan. 29: Tools, jigs, fixtures and manufacturing methods employed by leading French and American manufacturers. Feb. 5: Special tools and methods used to insure accuracy of apparatus. Feb. 19: French and American finishing processes. Dec. 18: Theory and processes employed in this country and in France in manufacturing range-finding instruments and mechanical means for solving trigonometrical functions.

The Works and Products of Messrs. Barr and Stroud, Limited. Engineering, vol. 108, no. 2812, Nov. 21, 1919, pp. 669-672, 3 figs. Fortress rangefinders and mountings.

Sound Ranging of Guns. Sound Ranging, Edward Beattie Stephenson. Engr. School, U. S. A., Occasional Papers, no. 63, 1920, 25 pp., 12 figs. Notes on location of guns by sound with special reference to the Bull-Tucker system.

Sound-Ranging, Augustus Trowbridge. Jl. Franklin Inst., vol. 189, no. 2, Feb. 1920, pp. 133-146, 2 figs. Exposition of principles of sound ranging and discussion of limitation to accuracy attained by sound ranging in Am. Expeditionary Force.

[See also HOWITZERS.]

ARTILLERY FIRE

Flash Extinction. Cause of Flashes Produced by Artillery Fire and Method for Extinguishing (Sur les lueurs produites par le tir de l'artillerie. Procédé général d'extinction de ces lueurs), M. Delpech. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 581-583. Flashes are said to be caused by violent and instantaneous combustion of masses of carbonic oxide and methane in contact with air. Addition of grease to powder is said to be principal element in process of extinction.

Observation of. See AEROPLANES, Artillery Fire Observation.

Ranging. Flash and Sound Ranging, Howard W. Hodgkins. Jl. U. S. Artillery, vol. 52, no. 1, Jan. 1920, pp. 41-54, 3 figs. Illustrates trigonometric derivation of formula used in plotting sound ranging data.

ARTILLERY FIRE CONTROL

Coast Defense. Fire Control, W. P. Wilson. Jl. U. S. Artillery, vol. 53, no. 2, Aug. 1920, pp. 147-174. Positive position finding for long ranges is advocated for Coast Defense service. Method is outlined.

High-Burst Ranging. The Telemetric System of High-Burst Ranging, Montague Blundon. Prof. Memoirs, Corps of Engrs., U. S. Army & Engr. Dept. at Large, vol. 11, no. 59, Sept.-Oct. 1919, pp. 543-570, 15 figs. Outline of system and description of instruments used, also exposition of theory involved and account of operations performed.

Wind Measurements. The Ballistic Wind, I. R. Tannehill. Jl. U. S. Artillery, vol. 52, no. 6, June 1920, pp. 553-576, 7 figs. It is pointed out that the pilot balloon and other methods of measuring wind aloft furnish artilleryman with actual values of movement of atmosphere at various levels. Matter of determination of weighting factors to be used and methods of making corrections at batteries are said to be under consideration. It is believed that methods herein represent Signal Corps methods of measuring wind aloft and temporary means of making corrections at battery, which are now available to artillerymen.

Work of Field Survey Troops. Field Survey Troops: Their Work at the Front, E. W. Berry. Can. Engr., vol. 38, no. 13, March 25, 1920, pp. 317-320, 2 figs. How draftsmen, photographers, lithographers and topographers assisted artillery commanders.

ASBESTOS

Commercial Utilization. Asbestos, Oliver Bowles. Dept. Interior, Bur. Mines, Monthly Reports on Investigations, Nov. 1919, 4 pp. Characteristics of specimens found in various parts of the world, and historical survey of commercial utilization.

Use in Paint Industry. The Use of Asbestos in

the Paint Industry, G. B. Heckel. Contract Rec., vol. 34, no. 31, Aug. 4, 1920, pp. 741-742. Discussion of functions of reinforcing pigments. Formula for fire-retardant paint.

ASH HANDLING

Bucket-Carrier System. An Efficient Coal and Ash Handling Plant, Henry I. Edsall. Coal Trade Jl., vol. 51, no. 4, Jan. 28, 1920. Installation using Peck overlapping pivoted bucket carrier to distribute fuel and take away ashes.

Plants. Automatic Ash-Removing Plants (Selbsttätige Entaschungsanlagen), A. Rüster. Zeitschrift des Bayerischen Revisions-Verein, vol. 23, no. 20, Oct. 31, 1919, pp. 157-159, 5 figs. Details and illustrations of light ash suction plant, ash retainer, suction nozzle, traveling machine for breaking clinkers, and air-pump suction apparatus for cleaning flue.

Pneumatic Ash-Handling Installation in the Boiler Plant of the Werner Works No. II of the Siemens & Halske Corp. (Die pneumatische Entaschungsanlage im Heizwerk des Wernerwerkes II der Siemens & Halske A.-G.), W Uhlig. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 10 and 11, Mar. 5 and 12, 1920, pp. 73-75 and 82-84, 11 figs. Describes installation for plant containing 8 Steinmüller watertube boilers with total heating surface of about 2900 sq. m.

See also COAL HANDLING, Plants.

Vacuum and Steam Systems. Ash-Handling in Power Plants, Robert June. Elec. Rev. (Chicago), vol. 76, no. 8, Feb. 21, 1920, pp. 308-310, 1 fig. Comparative study of vacuum and steam ash-handling systems.

[See also COAL HANDLING, Power-Plant Equipment.]

ASPHALT

Balkan States, Deposits in. The Origin, Phenomena and Quality of the Dalmatian Asphalt Beds (Ursprung, Vorkommen und Beschaffenheit der dalmatinischen Asphaltlagerstätten), Fritz Kerner v. Marilaun. Berg- und Hüttenmännisches Jahrbuch, vol. 67, no. 4, 1919, pp. 275-308, 5 figs. Geology of dolomite and other stone formations in Dalmatia. Notes on impregnation and infiltration phenomena and the chemical properties of the Dalmatian asphalt.

Distillation. See FURNACES, Asphalt-Rock Distillation.

German Processes. Technical Asphalt and Pitch Preparations (Technische Asphalt- und Pechpräparate), Emil J. Fischer. Kunststoffe, vol. 10, no. 3, Feb. 1, 1920, pp. 30-32. Includes tabular data of the most important German processes for production of asphalt and pitch preparations.

Peru, Deposits. Asphalt Deposits in Peru (Estudios sobre algunos yacunientos de asfaltita de la region de Marcapomacocha), J. A. Broggi. Informaciones y Memorias de la Sociedad de Ingenieros del Peru, vol. 22, July 1920, pp. 235-253. Geologic study with deductions as to present and future value of region.

Softening Point. Determination of the Softening Point of Asphaltum and Other Plastic Substances, D. F. Twiss and E. A. Murphy. Jl. Soc. Chem. Indus., vol. 38, no. 23, Dec. 15, 1919, pp. 405T-406T, 2 figs. Arrangements to simplify introduction of bituminous material into tube in Krämer-Sarnow method.

Sources of. The Lake Asphalt Industry, J. Strother Miller. Chem. & Metallurgical Eng., vol. 22, no. 16, Apr. 21, 1920, pp. 749-754, 8 figs. Description of most important sources of natural asphalt, Trinidad Lake and Mermudez Lake; and refining and fluxing. Ultra-microscope is said to show presence of colloidal clay particles. Review of theory of colloidal state.

Trinidad, Mining. Production of Asphalt from Trinidad Lake, Henry D. Baker. Better Roads & Streets, vol. 9, no. 6, July 1919, pp. 223-224, 2 figs. Methods of mining necessitated by constant movement of lake.

[See also MANJAK.]

ASPHALT PAVEMENTS

See PAVEMENTS, ASPHALT.

ASTIGMATISM

See OPTICS, Astigmatism.

ATMOSPHERE

Electricity from. The Recovery of Energy from the Atmosphere (Die Gewinnung von Energie aus der Atmosphäre), W. Wolf. Elektrotechnischer Anzeiger, vol. 37, no. 103, June 29, 1920, pp. 469-471. Refers to H. Plauson's book entitled "Recovery and Utilization of Atmospheric Electricity," (Boysen & Maasch, Hamburg), describing new method for solution of problem, by use of which, in writer's opinion, large quantities of electric energy could be obtained.

Polarization of. Explanation of the Phenomena of Atmospheric Polarization (Versuch einer einheitlichen Erklärung der Erscheinungen der atmosphärischen Polarisation), Marie Anna Schirmann. Annalen der Physik, vol. 61, no. 2, Jan. 15, 1920, pp. 195-200, 2 figs. Based on theoretic results described, statement is made that with electromagnetic diffraction theory it is possible to uniformly account for all the problems of the atmospheric polarization from the size and optic behavior of the turbid particles of the atmosphere. Report from the Physical Inst. of the Vienna University.

Transparency, Measurement of. Method of Measuring Transparency of Atmosphere (Sur une méthode pour la mesure de la transparence atmosphérique), André Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 93-97, 1 fig. Differential method analogous to that employed for measuring absorbing power of a liquid.

Turbulence of. Some Measurements of Atmospheric Turbulence, Lewis F. Richardson. Phil. Trans. Royal Soc. of London, Series A., vol. 221, pp. 1-28, 4 figs., 3 on supp. plate. Discusses stresses, eddy viscosity and diffusivity, theory of scattering of particles in air, and cumulus eddies in calm weather.

[See also METEOROLOGY.]

ATOMIC PHYSICS

Survey of. See ELECTRONS, Radium and.

ATOMIC WEIGHTS

Error in. Mathematical Proof That the Atomic Weights Are Integers When O = 16, Hawksworth Collins. Chem. News, vol. 119, Nov. 28, 1919, no. 3111, pp. 247-248. Including also reasons which in opinion of writer establish that there are large errors in higher atomic weights.

[See also CHEMICAL ELEMENTS, Atomic Weights.]

ATOMS

Atomic Forces. Atomic Forces (Bemerkungen über Atomkräfte), W. Kossel. Zeitschrift für Physik, vol. 1, no. 5, 1920, pp. 395-415, 3 figs. Contribution dealing with the classification of the atom-binding forces. Report from the Physical Inst. of the Münich Technical Highschool.

Constitution of. Passage of Corpuscular Rays through Matter and the Constitution of Atoms (Durchgang korpuskularer Strahlen durch Ma-

terie und Konstitution der Atome), R. Seeliger. Jahrbuch der Radioaktivität und Elektronik, vol. 16, no. 1, 1919, pp. 19-65, 1 fig. Diffraction of a-rays and electrons; theory of diffraction; critical remarks.

The Constitution of the Atom and the Properties of Band Spectra (Remarques sur la constitution de l'atome et les propriétés des spectres de bandes), H. Deslandres. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, nos. 14 and 18, Oct. 6-Nov. 3, 1919, pp. 593-599 and 745-752, 1 fig. Position of band is expressed by frequency of its middle and of its most intense part and formula is deduced for representing hole spectrum. Interpretation of coefficients in general formula for representing band spectra.

Energy Stored in. Sources of Power Known and Unknown, Oliver Lodge. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 108-112. Attention is directed specially to energy stored in atoms. Lecture delivered before Roy. Soc. of Arts.

Models of. Some Remarkable Models of Atomic and Molecular Structure, Oscar R. Foster. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 690-692, 16 figs. Plaster of paris spheres, representing electrons and electron aggregates, which are supported by wires and geometrically arranged in accordance with Langmuir's postulates.

Stability. Conditions of Stability of the Atoms (Conditions de stabilité des atomes), Félix-Joachim de Wisniewski. Archives des Sciences physiques et naturelles, vol. 2, July-Aug. 1920, pp. 301-308. Hypothesis as developed by Bohr, Debije and Krov is followed in the main but it is assumed that electric potential energy of atom is absolutely positive function.

Structure. Atom Construction and Radioactive Phenomena (Atombau und radioaktive Erscheinungen), H. Geiger. Zeitschrift für Elektrochemie, vol. 26, no. 13-14, July 1, 1920, pp 274-277, 1 fig. Discussion of problems on which core theory of atom is based, by which it is shown on what a sound experimental basis this theory rests, with which it is possible to explain a number of phenomena which were formerly unfathomable. It is shown that the core of the hydrogen atom is partially built up of hydrogen cores, and it is probable that helium cores and electrons form the only other structural parts.

Bakerian Lecture: Nuclear Constitution of Atoms, E. Rutherford. Proc. Roy. Soc., Series A., vol. 97, no. A 686, July 1, 1920, pp. 374-400, 4 figs. Discussion in detail of experiments that have been made with a view of throwing light on constitution and stability of nuclei of some of simpler atoms.

Rutherford's Latest Works on Atom Cores (Rutherford's neueste Arbeiten über den Atomkern), R. Seeliger. Jahrbuch der Radioaktivität u. Elektronik, vol. 16, no. 3, Mar. 30, 1920, pp. 292-302, 2 figs. Refers to Rutherford's four latest works on the Collision of Alpha Particles with Light Atoms in Philosophical Mag. (pp. 537-587, 1919) and points out results of his theory. Quotes his conclusion that "the nitrogen atom is disintegrated under the intense forces developed in a close collision with a swift particle, and the hydrogen atom which is liberated formed a constituent part of the nitrogen nucleus."

The Core Structure of Atoms (Die Kernstruktur der Atome), W. Lenz. Zeitschrift für Elektrochemie, vol. 26, no. 13-14, July 1, 1920, pp. 277-281. Notes on the Prout hypothesis; interpretation of the general properties of the core, namely, core dimension, atomic weights, and constancy and cleavage possibilities of core; radioactive cores. Address before German Bunsen Soc. for Applied Physical Chem.

The Stability of Atoms as Related to the Positive and Negative Electrons in Their Nuclei, and the Hydrogen, Helium, H_3, H_2 Theory of Atomic Structure, William D. Harkins. Jl. Am. Chem. Soc., vol. 42, no. 10, Oct. 1920, pp. 1956-1997.

The Structure of the Atoms (La structure des atomes), A. Berthoud. Archives des Sciences Physiques et Naturelles, vol. 1, no. 5, Nov. 1919, pp. 473-496, 2 figs. Exposition of Rutherford's theory as modified by Bohr.

ATTRACTION

Planetary. Planetary Attraction and the Helium Atom, A. C. Crehore. Jl. of Electricity, vol. 44, no. 7, Apr. 1, 1920, pp. 325-326. It is pointed out that substances composing sun, planets and other heavenly bodies are seemingly made up of mixed kinds of solid matter that offer interesting comparisons under analysis of author's new theory of mass and attraction. A star composed of helium is discussed and conclusions drawn. Ninth of a series of papers on The New Physics.

ATWOOD MACHINE

See MOTION, Recording Apparatus.

AUDIONS

See RADIOTELEGRAPHY, Audions; VACUUM TUBES, Audions; Detectors.

AUGER BITS

Manufacture of. "Mephisto" Bits—How They Are Made, S. A. Hand. Am. Mach., vol. 52, no. 1, Jan. 1, 1920, pp. 11-14, 17 figs. Methods used by W. A. Ives Mfg. Co., Wallingford, Conn., in manufacture of auger bits.

AUTOGENOUS WELDING

Failures. Welds and Welding—A Study of the Autogenous Processes, Walter Rosenhain. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 709-711. Analyzes failures and suggests remedies.

[See also OXY-ACETYLENE WELDING.]

AUTOMOBILE ENGINES

Acceleration Forces in. Unbalanced Forces in Reciprocating Engines, James Langmuir Napier. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 46-52, 10 figs. Tables are given showing acceleration forces and coefficients for five degrees of crank movements and for various proportions of crank and connecting rod.

Adapting to Various Fuels. Adapting Engines to the Use of Available Fuels, J. G. Vincent. Jl. Soc. Automotive Engrs., vol. 5, no. 5, Nov. 1919, pp. 345-348, 2 figs. Writer describes scheme evolved by him to solve the fuel problem and explains operation of device composed of four main units, namely, (1) a special inlet manifold which has water-jacket as well as combustion jacket; (2) a burner attached to combustion jacket; (3) a vaporizer used to furnish mixture for burner; and (4) an auxiliary ignition breaker and coil used to furnish spark for burner spark-plug.

Air Cooling. A Test of Air Cooling, B. H. Davies. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1064-1065, 3 figs. Road trial of air-cooled engine.

The Air-Cooling of Petrol Engines. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 211-213; also in Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 76-84, 8 figs., and Autocar, vol. 44, no. 1267, Jan. 31, 1920, pp. 217-218, 5 figs. Results of experimental work conducted during war in order to determine best shape

of fins, most adequate surface of cylinder, etc. Paper read before Instn. Automobile Engrs.

The Design of Cooling Surfaces for Air-Cooled Engines, W. Byron Brown. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1352-1355, 3 figs. Develops factors affecting efficiency of fins for air cooled engines and gives many references to other authorities. Equations and tables are included.

See also Cylinders.

Aluminum Cylinders. The Utilization of Aluminum for Engine Cylinders, Walter Rosenhain. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 912-913. Writer discusses problem of aluminum-alloy cylinder with direct reference mainly to air-cooled cylinders, but claims it is applicable to all those forms of water-cooled cylinders which are cast in such a manner that each barrel is formed by a complete aluminum cylinder into which a liner is inserted. Advantages and disadvantages of various methods are pointed out.

Aluminum in. The Status of Aluminum in the Automobile Engine, J. Edward Schipper. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 468-470, 6 figs. After five years of development, engineers are unable to agree as to future of lighter metal. Most of those who are using it for pistons are firm believers, but there seems to be limit in size. It is popular for crankcase housings, but has not been adaptable for axle manufacture.

Argyll. The New 159 hp. Argyll Engine. Autocar, vol. 44, no. 1270, Feb. 21, 1920, pp. 331-332, 6 figs. Power-unit with Burt-McCullum single-sleeve valve.

Balancing. Balance of V-Engines with Eight Cylinders Set at 90 Degrees (Equilibrage des moteurs à 8 cylindres en V a 90°), H. Petit. Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 6-9, 4 figs. Diagrams of inertia forces, both horizontal and vertical.

Bearings. See Die-Cast Bearings.

British. A British "Twin-six" Motor Car Engine. Engr., vol. 119, no. 3349, Mar. 5, 1920, pp. 252-254, 3 figs. Details of a 12-cylinder engine for touring cars, unique feature of which is said to be that the two blocks of six cylinders have an angle of 30 deg. between them; crankshaft has only three throws and two journal bearings, the latter of roller type.

Bude. Varied-Duty Engines in Bude Series. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 764-766, 5 figs. Construction details of series of eight models, of four-cylinder L-head type.

Burt. The New Burt Engine. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 358-360, 10 figs. Four-cylinder, 15.9 hp., single sleeve valve power unit, fitted in new Argyll chassis.

Burt-McCullum. The Burt-McCullum Engine. Auto, vol. 25, no. 8, Feb. 19, 1920, pp. 201-204, 10 figs. Improvement of single-sleeve-valve motor. Instead of helical gearing by which sleeves were given their combined semi-rotary and reciprocating motion through link-pieces in previous model, valve shaft is used which resembles small-throw crankshaft with throw nearly opposite vertical axis of each cylinder and is driven by silent chain from crankshaft.

Caffort Kerosene. The Caffort Paraffin Engine. Automobile Engr., vol. 10, no. 139, June 1920, p. 242, 4 figs. Built by Caffort Co., Paris, France. Design incorporates Bellem and Bergeras system of fuel supply, which, fitted to Unic engines, won kerosene engine competition instituted by French Automobile Club in 1918.

Calculations, Chart for. Alignment Chart for Petrol Engine Calculations. Automobile Engr., vol. 10, no. 136, March 1920, pp. 113-114, 1 fig. Calculations intended to be simplified are volume swept out by piston, R. A. C. rating for engine, volume of compression space for given compression ratio, etc.

Cameron Air-Cooled. The Cameron Air Cooled in a "Comeback." Automotive Industries, vol. 41, no. 24, Dec. 11, 1919, pp. 1164-1166, 6 figs. Valves are operated by groove cams mounted on crankshaft in bottom of crank case.

Cams. Cams for Radial and Rotary Engines, Wm. John Walker. Automobile Engr., vol. 10, no. 139, June 1920, p. 241, 1 fig. Design of multilobed cam suitable for operating valves of given multi-cylinder engine of four-stroke type, cam being rotated at certain speed in opposite direction to that of crankshaft.

Camshafts. The Problems in Designing an Engine Camshaft, Don T. Hastings. Automotive Industries, vol. 41, nos. 22 and 23, Nov. 27 and Dec. 4, 1919, pp. 1072-1080 and 1116-1124, 4 figs. Nov. 27: Valve timing and operating mechanism; tangential and mushroom cams; constant acceleration cam. Dec. 4: Comparison of action obtained from tangential and mushroom cams.

Carburetors. See CARBURETORS.

Clayden. The Clayden Engine. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1073-1074, 4 figs. Principal specifications are: 20 hp. four cylinders, 90 x 135 mm.; multi-disk Ferodo-lined clutch; four-speed gear box; three-quarter floating, bevel-driven rear axle.

Connecting Rods. Comparative Methods of Machining Automobile Engine Connecting Rods, Fred H. Colvin. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1023-1035, 42 figs. Practices in manufacture of connecting rods for Packard, Cadillac, Peerless, Chandler and Franklin cars.

Producing 17,000 Connecting Rods a Day—I, Fred H. Colvin. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1199-1203, 13 figs. Methods used by Ford Motor Co. Rod and cap are forged separately up to final boring, facing and broaching operation.

Seventy-Five Operations Give Accuracy in Connecting Rod Production, J. Edward Schipper. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 522-526, 14 figs. Production methods for manufacturing connecting rods used on Marmon cars.

See also CONNECTING RODS, Failures at High Speeds.

Continental. New Continental Engine an Exceptional Production Job. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 400-402, 5 figs. Engine is 3¼ x 4½-in. 6-cylinder-unit power plant type with removable cylinder head and aluminum crankcase.

Coventry Victor. Machine Tool Practice as Applied to Motor Production, James H. Garnett. Machy. (Lond.), vol. 15, no. 392, Apr. 1, 1920, pp. 837-842. Manufacturing operations involved in production of Coventry Victor motor, 5-7 hp. twin engine. Unusual feature of engine is design of patent connecting rod which has simple one-bolt fastening for big-end in order to obviate risk of its coming adrift and damaging engine.

Crankshafts. Accuracy Essential Feature of Crankshaft Manufacture, J. Edward Schipper. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1458-1460, 10 figs. Methods of National Co. of Indianapolis, Inc., for securing proper alignment of crankshaft.

Inertia Torque in Crankshafts, F. A. Stepney Acres. Automobile Engr., vol. 10, no. 138,

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May 1920, pp. 208-216, 16 figs. Different crank arrangements are compared from viewpoint of internal stresses in crankshaft set up by inertia torque.

How to Prevent Torsional Vibration in the Camshaft, P. M. Heldt. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 26-28, 3 figs. Damper with very thick web in which holes were drilled for coiled springs that press together friction plates at both sides of web is said to have proven entirely satisfactory.

Cylinders. Accelerating Cylinder Production. Foundry, vol. 48, no. 345, Apr. 15, 1920, pp. 311-318, 15 figs. Details of foundry of the Nash Motor Co. in Kenosha, Wis., which, it is said, produces all its own castings. Attention to minute detail and adoption of every mechanical aid to speed and accuracy have, it is claimed, increased output of automobile cylinders in this plant.

Air-Cooled Cylinders for Franklins. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 705-718, 58 figs. Method of machining engine cylinders for Franklin, Packard, Cadillac, Chandler and Peerless automobiles.

Automobile Cylinder Blocks. Automobile Engr., vol. 9, no. 133, Dec. 1919, pp. 424-426, 5 figs. Notes on special machines for mass production.

Machine Tool Practice as Applied to Motor Car Production, James H. Garnett. Machy. (Lond.), vol. 15, nos. 371-373, 374 and 376, Nov. 6, 20 and 27, and Dec. 11, 1919, pp. 161-173, 225-227, 253-260, and 317-322, 76 figs. Methods followed in English shops. Tooling methods employed on cylinder and crankshaft production. Vertical boring mill practice and crankshaft production in manufacture of Daimler car.

Precautions That Must Be Taken in the Manufacture of Automobile Cylinders (Précautions à prendre pour la fabrication des cylindres d'automobiles), Charles Bichon. Fonderie Moderne, no. 9, pp. 207-211, 2 figs. Suggestions in regard to manner of drying molds, proportioning metal, etc.

The Detachable Cylinder Head, Georges Funck. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 139-142, 14 figs. Various constructions criticized from point of view of designer, manufacturer and user.

See also Aluminum Cylinders.

Darracq. Darracq 8-Cylinder, 20-hp. Engine Has American Features. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 756-758, 5 figs. Model exhibited at Paris show has increased accessibility of engine parts of integral manifolds and cross shaft for driving water pump and generator.

Design. Engine Design for Maximum Power and Economy of Fuel, C. A. Norman. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 182-185, 2 figs. Influence of air heating on power, delayed combustion, supercharging, etc.

Modern Tendencies in Engine Design, L. H. Pomeroy. Automotive Manufacturer, vol. 62, no. 1, Apr. 1920, pp. 13-16, 1 fig. Summary of attempts made to employ other fuels than gasoline, and of studies undertaken to determine crankcase lubricant dilution by gasoline and best materials for various engine parts.

Needs in Engine Design, Frank H. Trego. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 14-15. Needs pointed out are closing intake valve early, small size of intake passages and application of heat to mixture after it leaves carburetor.

Tendencies in Engine Design, L. H. Pomeroy. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 29-43, 14 figs. Improvements are noted in mechanical efficiency, engine balancing and carburation and progress is surveyed in utilization of low-grade fuels.

Die-Cast Bearings. The Manufacture and Use of Die-Cast Engine Bearings, H. C. Skinner. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1160-1162, 7 figs. Experience and present practice of Franklin Die-Casting Corp.

Dorman. Dorman Internal-Combustion Engines. Eng., vol. 109, no. 2828, Mar. 12, 1920, pp. 342-344, 9 figs. partly on supp. plate. Details of two models, 25-hp. commercial vehicle type and 12-hp. overhead-valve car engine.

Double-Piston Type. New Crank Motion Embodied in Engine, P. M. Heldt. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 405-407, 3 figs. Description of engine of double-piston type, each cylinder containing two pistons between heads of which explosion takes place.

Duplex. The 10-30 H.P. Duplex. Auto, vol. 25, no. 3, Jan. 15, 1920, pp. 66-68, 7 figs. Sparking plugs are inserted over pistons on induction side and manifolds are cast in cylinder block.

Efficiency, Bettering. Bettering the Efficiency of Existing Engines, Hugo C. Gibson. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 7-13, 4 figs. Procedure for bettering efficiency of existing engines is outlined which includes taking gasoline from sources having end point 100 deg. fahr. higher than is used today, adopting evaporating apparatus to engines now in production for heating mixture between carburetor and engine to such a point that diffusion of fuel gases and air is complete before spark is applied, and securing automatic control of temperature of mixture.

Exhaust Heat, Utilization of. Utilizing the Waste Heat of the Exhaust. Autocar, vol. 44, no. 1275, Mar. 27, 1920, pp. 583-584. Scheme for utilizing waste heat for generating electric power by means of thermopile. It is intended to use power thus obtained for ignition purposes.

Farman Six. Aviation Practice Features Farman Six Cylinder. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 866-867 and 870, 4 figs. Engine of aviation type, developing 85 hp., fitted to automobile.

Fiat. An Unusually Powerful Six-Cylinder Engine. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 728-731, 7 figs. Particulars of Fiat engine.

Ford. Machining Over 200 Cylinder Blocks Per Hour, Fred H. Colvin. Am. Mach., vol. 52, no. 11, March 11, 1920, pp. 563-569, 24 figs. Manufacturing methods used at Ford shops.

Fuel-Consumption Measurement. The Bowden Petrometer. Auto, vol. 25, no. 31, July 29, 1920, pp. 799-800, 4 figs. Electrically operated device which registers fuel consumption.

Fuel Consumption, Reducing. Fuel Economy and Engine Design, H. R. Ricardo. Autocar, vol. 44, no. 1287, June 19, 1920, pp. 1135-1140. Possibilities of improving present designs with a special view to economy of fuel. Factors which are mentioned as having great influence on fuel consumption are: (1) Internal friction and (2) design of combustion head. In this connection side-by-side valves are recommended in preference to overhead valves.

Fuel Pump. An Interesting Invention. Autocar, vol. 43, no. 1261, Dec. 20, 1919, p. 1152, 2 figs. Fuel pump having no loose valves.

Horsepower Formulas. New Horsepower Formulæ, P. M. Heldt. Automotive Industries, vol. 41,

no. 20, Nov. 13, 1919, p. 959. Proposes that for passenger car engines rule be adopted of one horsepower per 10.55 cu. in. piston displacement at 1000 r.p.m. and proportionately more at higher speeds.

Ignition. A Flexible Closed Circuit Type of Ignition. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1258-1259, 5 figs. System which may be changed from four-cylinder ignition set to one adapted to six-cylinder machine.

See also IGNITION; IGNITION APPARATUS.

Inertia Forces in. Influence of Inertia Forces Upon Torque Variations of an Automobile Engine (Influence des forces d'inertie sur la variation du couple moteur), H. Petit. Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 9-18, 7 figs. Diagrams of inertia forces and torque diagrams, constructed for six-cylinder, eight-cylinder and twelve-cylinder engines.

Intake Manifolds. Design of Intake Manifolds for Present Heavy Fuels, F. C. Mock. Jl. Soc. Automotive Engrs., vol. 6, no. 3, Mar. 1920, pp. 189-194, 4 figs. Rules of design are formulated, such as for example that no two valves should follow each other in same pocket unless they operate at equally spaced intervals of engine rotation, that distance from tee or point of division to each valve should as nearly as possible be the same, avoiding sudden enlargements, etc. Experiments are claimed to have indicated that under steady non-pulsating air-flow, velocity of 38 ft. per sec. is necessary to keep atomized drops off walls in vertical pipe, and that to keep intake manifold walls clean of fuel beyond tee or sharp bend, velocity of about 75 ft. per sec. is required.

Designing a More Efficient Intake Manifold, W. D. Bell. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1334-1335, 4 figs. Brief analysis of problems involved in delivery of fuel from carburetor to combustion space, showing photographs of shadows cast by particles of fuel when illuminated by electrical discharges.

Intake-Manifold Temperatures and Fuel Economy, W. S. James, H. C. Dickinson, and S. W. Sparrow. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 131-137, 11 figs. It is concluded (1) that at constant speed, mixture ration, and power output, fuel consumption in lb. per b. hp., is independent of temperatures and methods of heating the intake charge within the range tested; and (2) the rate at which an engine will accelerate with a given mixture ratio, or carburetor setting, is markedly affected by amount of heat supplied and its method of application.

Lafayette. Lightness, Simplicity and Accessibility Feature LaFayette Engines, J. Edward Schipper. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 397-399, 10 figs. Attention is specially called to valve mechanism where camshaft permits of direct-operated valves and also to use of steel alloy tubing in several places as substitute for solid shafts.

Liberty. A Specially Designed Engine for the Liberty Car, P. M. Heldt, Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 558-561, 4 figs. Engine is of a 6-cylinder block type, 3½ in. bore and 5 in. stroke. Cylinder heads are cast in pairs and three identical head castings are then bolted to same cylinder block.

Lubricating Oils for. Engine Oils, W. R. G. Atkins. Automobile Engr., vol. 9, no. 133, Dec. 1919, pp. 426-429. Outline of chemical and physical tests usually applied to oils, and discussion of serviceableness of each.

Lubrication Control. Lubrication Control in Conformity with Engine Load, Fred C. Ziesenheim. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1342-1343, 4 figs. Discussion of a by-pass valve actuated by intake manifold vacuum, used as a means of lubrication control in a full-pressure oiling system.

Magnetos. See MAGNETOS.

Manufacture. See Coventry Victor; Ford; Pistons.

Marmon. Heavy Crankshaft Features New Marmon Engine, J. Edward Schipper. Automotive Industries, vol. 42, no. 5, Jan. 29, 1920, pp. 347-353, 10 figs. Shaft, which is 2¾ in. in diameter and is mounted on three bearings, is said to eliminate periodic vibration at any speed. Piston is of aluminum and iron construction. Cylinders are fastened to crankcase in same manner as head is attached to cylinder block, studs extending through block to head.

Mixture Requirements. Mixture Requirements of Automobile Engines, O. C. Berry. Jl. Soc. Automotive Engrs., vol. 5, no. 5, Nov. 1919, pp. 364-370, 11 figs. Also in Gas Engine, vol. 22, no. 2, Feb. 1920, pp. 57-63, 11 figs. It is concluded from tests at Purdue University Engineering Experiment Station that: (1) Mixture giving maximum power does not vary materially with brake load carried, but remains constant at about 0.0775 lb. of gasoline per lb. of dry air; (2) at light loads, engine will not operate well with as wide a range of mixtures as it can use when carrying more nearly its full capacity; and (3) mixture giving maximum thermal efficiency becomes leaner as brake load is increased, specially between no load and half load.

Molding Work. See MOLDING METHODS, Automobile Parts.

Mufflers. New Muffler Constructions (Neue Schalldämpfer-Konstruktionen). Motorwagen, vol. 23, no. 12, Apr. 30, pp. 195-197, 4 figs. Describes new patented devices by A. Goldbeck, Berlin; the Air Traffic Co., Ltd., Berlin-Johannisthal; Arno Dietrich, Nurnberg; and the Kondor Aeroplane Works, Ltd., Essen.

The Johest Spiral Muffler (Der Johest-Schneckenschalldämpfer), Hans Heinz. Oel- u. Gasmaschine. vol. 17, no. 7, July, 1920, p. 106, 1 fig. A new combined muffler and smoke-preventing device, advantages of which are enumerated.

The Muffling of Exhaust Gas Noises (Die Dämpfung der Abgasgeräusche), H. Praetorius. Motorwagen, vol. 23, no. 8-9, Mar. 20-31, 1920, pp. 155-159, 11 figs. Details of some new muffler constructions.

Napier. Economies of Light Weight Emphasized in New Modeln Napier. Automotive Manufacturer, vol. 62, no. 5, Aug. 1920, pp. 7-11, 7 figs. Specifications: Overall length, 67½ in.; overall width, 56 in.; number of cylinders, 6 cast en bloc; cylinder bore, 4 in.; piston stroke, 5 in.

National. Overhead Valve Engine in the National. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 656-660, 8 figs. Peak is 71 B.hp. at 2,600 r.p.m.; speed range from 3 to 65 miles per hour is provided on high gear, ratio being 4 to 1.

Oberting. High-Speed Light Engine Has Quick Take-Down Feature. Automotive Industries, vol. 43, no. 6, Aug. 5, 1920, pp. 254-255, 2 figs. Engine built by Oberting Motors Co. said to have only four sizes of nuts in entire design.

Off-Set. The Off-Set Motor (Les Moteurs désaxés), H. Petit. Vie Automobile, vol. 16, no. 711, Aug 10, 1920, pp. 293-295, 9 figs. Graphs showing comparative lateral pressures in cylin-

der for ordinary type and off-set type. In off-set motor center of crank does not lie in projection of axis of cylinder.

Packard. The Six-Cylinder Edition of the Packard Car, J. Edward Schipper. Automotive Industries, vol. 43, no. 14, Sept. 30, 1920, pp. 654-658, 9 figs. L-head with six 3⅜ in. by 4½ in. cylinders cast in block. It is rated at 27.34 hp.

Paige. Paige Announces New Engine for Big Six Model, J. Edward Schipper. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 507-509, 6 figs. L-head type, 3¾ in. x 5 in., six cylinder, block-cast unit with separate cylinder head, aluminum crankcase and pressed steel oil pan.

Patents. Inventions, B. H. Davies. Autocar, vol. 43, no. 1262, Dec. 27, 1919, pp. 1177-1179, 13 figs. Review of and comments upon recent automobile and aero engine patent specifications.

Pistons. Automobile Engine Pistons as a Stock Proposition, Ellsworth Sheldon. Am. Mach., vol. 53, no. 10, Sept. 2, 1920, pp. 437-441, 15 figs. Details of tools, fixtures and machines used by the Houpert Machine Co., Long Island City, in the manufacture of pistons, piston rings and wristpins, with description of many of the operations.

Cast-Iron and Aluminum Pistons, Fred H. Colvin. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 416-421, 18 figs. Methods used by builders of Studebaker and Oakland cars in machining their pistons.

Improved Method of Machining Pistons Lowers Cost. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 709-711, 4 figs. Method is outlined for reducing labor cost by performing various operations automatically.

Machining Automobile Engine Pistons, Ralph E. Flanders. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 710-713, 7 figs. Also in Machy. (Lond.), vol. 16, no. 400, May 27, 1920, pp. 240-243, 7 figs. Description of methods and tooling equipments used in quantity production of automobile-engine pistons, with special reference to equipment used in various turning, facing, boring and grooving operations performed on Fay automobile lathes.

Making 21,000 Pistons a Day, Fred H. Colvin. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 819-828, 31 figs. Practice in Ford, Cadillac and Autocar shops.

Methods of Making the Winton Piston, Fred H. Colvin. Am. Mach., vol. 52, no. 18, April 29, 1920, pp. 927-934, 27 figs. Practice in Winton, Franklin, White and Packard shops.

New Type Aluminum Piston in Cole. Motor Age, vol. 38, no. 9, Aug. 26, 1920, pp. 13 and 29. It is said that an aluminum piston that will not "slap" or stick has been developed by Cole engineers. Such piston is claimed to have worked satisfactorily in trials at Indianapolis motor speedway under A. A. A. suction. No details of piston are given.

Use of Aluminum Features in 1920 Premier. Automotive Industries, vol. 41, no. 23, Dec. 4, 1919, pp. 1112-1113, 4 figs. Aluminum is used for pistons and it is asserted that sticking difficulties have been overcome.

Premier Valve Mechanism. Details of Valve Mechanism on New Premier. Motor Age, vol. 37, no. 2, Jan. 8, 1920, p. 30, 2 figs. Rocker arms are lubricated by wick system and end of rocker arm has rolling action.

Racing Cars. The Design and Construction of the 183 cu. in. Engine, H. Gerster and W. F. Bradley. Automotive Industries, vol. 42, nos. 13 and 14, March 25 and April 1, 1920, pp. 756-759, 764 and pp. 808-811, 11 figs. Survey of European practice in manufacture of racing cars. Structural features of pre-war 85 x 132 mm. type, which ran at 1950 r.p.m. and developed 42 hp. and of post-war type, 80 x 140 mm., having same cylindrical capacity, but developing 48 hp. Both are L-head type.

Radiators. A New Style Winter Radiator. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, p. 17, 1 fig. Device consists of drawn steel shell fitting over core of radiator and is attached by four bolts which pass through it.

Ford Motor Radiator, Fitted with Deane Tubes. Engr., vol. 129, no. 3358, May 7, 1920, p. 484, 3 figs. Tubes are not soldered to top and bottom tanks, but can be readily and quickly removed and replaced either one by one or in numbers.

Manufacturers Producing Major Part of Automobile and Aeroplane Radiators Use Gas for Every Operation Requiring Heat, Charles A. Drum. Am. Gas Eng. Jl., vol. 111, no. 22, Nov. 29, 1919, pp. 505-508, 8 figs. Notes on manufacture of radiator.

Special Methods for Making Radiators, Fred H. Colvin. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 176-177, 5 figs. Methods of assembling, soldering and testing radiators.

The Thermo-Siphon Cooling of Automobiles (Die Thermosyphon-Kühlung an Motorwagen), G. Schwarz. Motorwagen, vol. 22, no. 35, Dec. 20, 1919, pp. 669-676, 5 figs. Nature of automatic water circulation in radiators is briefly described and conditions investigated under which it is possible. Experiments and measurements for determination of circulation resistance and exchange of heat in radiators are described and comparison made between automatic circulation or feed by water pump.

Rochester-Duesenberg. New Rochester-Duesenberg Engine. Motor Age, vol. 37, no. 2, Jan. 8, 1920, pp. 34-35, 2 figs. Principal specifications are: Cylinders, cast in block; pistons, magnalite aluminum alloy; connecting rods, I-section, vanadium steel; crankshaft, two-bearing; lubrication system, force-feed; water pump, impeller type.

Rotary Valve for. A Rotary Valve not Moved by Pressure in Cylinder. Automotive Industries, vol. 41, no. 25, Dec. 18, 1919, p. 1217, 4 figs. Valve receives its motion from cam disk and begins to move only after spent gases have been eliminated.

Sage. The 15.6 h.p. Six-cylinder Sage Engine. Autocar, vol. 44, no. 1274, Mar. 20, 1920, pp. 523-525, 7 figs. Overhead valve engine of 1891 c.c.

The Sage Engine. Automobile Engr., vol. 10, no. 136, Mar. 1920, pp. 103-106, 12 figs. Six-cylinder unit with separate cylinders, overhead camshaft and valves, giving output of about 45 b.hp. at 2000 r.p.m. Engine is shortly to be manufactured by F. Sage & Company, aircraft constructors, of London and Peterborough, England.

Saxon. Saxon Offers Changed Design and Construction in New Model, J. Edward Schipper. Automotive Industries, vol. 42, no. 13, March 25, 1920, pp. 748-751, 6 figs. Engine has overhead valves, deep frame construction and double transverse cantilever springs.

Sleeve-Valve. A New Sleeve-Valve Motor: The Serex. Auto, vol. 25, no. 35, Aug. 26, 1920, pp. 896-897, 3 figs. Original features are that main inlet and exhaust ports are differently located from either Argyll or Knight, that it possesses separate fuel admission, and that although it is a four-stroke motor, piston cooperates with sleeve to determine opening and closing of inlet, exhaust and fuel admission ports.

Spark Plugs. See SPARK PLUGS.

Starter Ring Gear. Flywheel Starter Ring Gears, Fred H. Colvin. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 513-515, 1 fig. Manufacture by Ford Motor Co. of steel ring gear that bolts to flywheel and which obviates broken teeth as well as undue wear.

Starting Systems, Electric. Electric Starting Systems for Automobiles, F. C. Barton. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 186-193, 12 figs. Design, characteristics and operation of single-unit, two-unit and combination-unit types of starting and lighting equipment are discussed. Examples are given of methods employed in selecting size of units for assumed requirements.

Stroke-Bore Ratio. Analyzing the Question of the Stroke-Bore Ratio, Edward G. Ingram. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1016-1019, 2 figs. Analysis of long- versus short-stroke engines taking into consideration all forces acting on bearings. Writer concludes that bearing loads will be lower in short-stroke type at high speeds.

Studebaker. Studebaker Selects Lighter Six for Large Production, J. E. Schipper. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 501-504, 5 figs. Demountable aluminum head with intake cast integral is feature of L-head engine.

Supreme. Original Lubrication Features on Supreme Engines, P. M. Heldt. Automotive Industries, vol. 43, no. 14, Sept. 30, 1920, pp. 660-663, 7 figs. Engine for passenger cars and light trucks developed by Supreme Motors Corp. Camshaft is drilled to conduct oil to its three bearings and also to feed oil through drilled holes to three main crankshaft bearings. Luminous gage in oil reservoir is introduced. Engines will be made in four and six cylinder types, 179 and 249 cu. in. piston displacement.

Temperature Control. Reducing the Cold Engine Troubles, J. Edward Schipper. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1014-1015, 2 figs. Device which puts water circulation under control of driver by means of butterfly valve, controlled by Bowden wire from dash, in one of pipes.

Testing. Experimental Separation of Engine Losses Develops Interesting Results, J. Edward Schipper. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1338-1341, 9 figs. Description of a series of tests conducted recently to determine mechanical losses in various engine parts. Largest single item was found to be due to the piston ring.

Organization and Method in the Testing Laboratory, P. S. Tice. Automotive Industries, vol. 42, no. 19, May 6, 1920, pp. 1061-1063. System is suggested which aims at eliminating haphazard running of tests by keeping complete and adequate records. Reference is made to method employed in dynamometer laboratory of carbureter division of Stewart-Warner Speedometer Corp.

The Electric Dynamometer Test of the Pierce Arrow Engine, Karr Parker. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 9, Sept. 1920, pp. 819-821, 7 figs. Special attention, it is claimed, was paid to locating equipment so that engine would not only receive proper test but would also pass from production to test directly without delay. Final test is conducted in sound-proof rooms, each engine being tested in a room by itself so as to detect knocks and noises which indicate engine trouble, and a power curve is taken of each engine.

Testing Beds. Torque Reaction Beds for Engine Tests. Aviation, vol. 7, no. 12, Jan. 15, 1920, p. 536. Design which is said to eliminate effect of forces through engine axis. From Zeitschrift des Vereines deutscher Ingenieure.

Torque Measurement. Unbalanced Forces in Reciprocating Engines, James Langmuir Napier. Automobile Engr., vol. 10, no. 136, March 1920, pp. 97-102, 9 figs. Method of measuring torque is illustrated with reference to various types of engines, for each of which diagram is constructed and explained.

Vacuum Fuel-Feed System. LePere Vacuum Fuel Feed System for Airplanes. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1450-1451, 5 figs. Investigations of this system, made at McCook Field by Eng. Division of Air Service are said to have established its applicability to motor car. Vacuum of gasoline supply system used on LePere biplane is generated by venturi tube placed in air stream above upper wing. Gasoline is drawn from main supply tank in fuselage to gravity distributing tank in upper wing.

Valves. Valve Failures and Valve Steels, Leslie Aitchison. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1264-1268, 2 figs. Also in Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 834-836, 3 figs. Gives account of experiments that have been made to obtain knowledge of properties which should be possessed by valve and indicates best methods of selecting suitable valve steel. Paper read before Inst. of Automobile Engrs.

See also Premier Valve Mechanism; Rotary valve for; Sleeve-Valve.

Vauxhall. 25 H. P. Four-Cylinder Motor Car. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 850-853, 16 figs. Constructed by Vauxhall Motors, Ltd. Specifications: Four cylinders cast monobloc, each 95 mm. bore by 140 mm. stroke; overall dimensions, 15 ft. by 5 ft. 8 in.; semi-elliptic springs, both front and rear.

Water Injection in Cylinder. The MM Auto- Injector (L'auto-injecteur MM), Nature (Paris), no. 2419, Aug. 14, 1920, pp. 51-52, 2 figs. Instrument which mixes water vapor with fuel charge entering cylinder. Fuel economy of 19 per cent is said to result from its use.

Waterproofing. Successfully Submerging a Gasoline Engine, Levin H. Campbell, Jr. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 251-253, 5 figs. Experiment conducted by Artillery Division of Ordnance Department. Details of waterproofing of Cadillac eight-cylinder engine used in self-propelled caterpillar mount Mark VII are given.

[See also AEROPLANE ENGINES, Construction Materials; CYLINDERS, Automobile Engines; CRANKCASES, Machining Operations; FLAME PROPAGATION; IGNITION; INTERNAL-COMBUSTION ENGINES; LABORATORIES, Carburetion Research; MOTOR TRUCKS, Engines; RESEARCH, Industrial Laboratories.]

AUTOMOBILE FUELS

Acetylene. The Use of Acetylene as Automobile Fuel (Ueber die motorische Verbrennung des Acetylens), F. Haber. Zeitschrift für Elektrochemie, vol. 26, no. 15-16, Aug. 1, 1920, pp. 325-329. States that consumption of acetylene in place of benzine or gasoline is for German conditions an important possibility provided production of carbide is increased by a greater production of coal. Address before German Bunsen Soc.

Alcohol. Alcohol as a Motor Fuel, Joseph V. Meigs. Chem. Age, vol. 1, no. 6, Dec. 10, 1919, pp. 265-268. Its possibilities.

Alcohol As Fuel. Automobile Engr., vol. 10, no. 137, April 1920, pp. 157-160, 5 figs. Survey of chemical and physical properties of alcohol which determine its adaptability as motor fuel

Alcohol as Motor Fuel. Times Eng. Supp.,

no. 537, July 1919, p. 223. Conditions of use.

Alcohol Fuel Patents. Motor Traction, vol. 31, no. 813, Sept. 27, 1920, pp. 310-311, 3 figs. Legal considerations affecting their validity.

Power Alcohol. Times Eng. Supp., vol. 16, no. 551, Sept. 1920, p. 274. Possible sources of alcohol supply in United Kingdom.

Shall the Corn Fields Run Our Cars? Robert G. Skerrett. Sci. Am., vol. 123, no. 12, Sept. 18, 1920, pp. 274 and 284, 4 figs. Possibilities of synthetic fuels, and source of alcohol to make them.

Alcohol-Benzol Mixtures. Alcohol-Benzol Fuels are Found Satisfactory Abroad. Power Wagon, no. 191, Oct. 1920, p. 22. Higher efficiency and easier starting is claimed for such fuels by London General Omnibus Co. who have experimented with them under service conditions. Mixtures used have been 50 per cent alcohol and benzol.

Alcohol-Benzole Mixtures. Motor Traction, vol. 30, no. 798, June 14, 1920, p. 572, 1 fig. Results of experiments made by London Gen. Omnibus Co. with 50 per cent mixture of alcohol and benzol are said to show the slight superiority of gasoline in respect of miles per gal.

Benzol. Benzol as Fuel for a 4½-Ton Motor Truck (Betrieb eines 4, 5 Tonnen Lastwagens mit Benzol-Treiböl), E. Fischer. Motorwagen, vol. 22, no. 20, 1919, pp. 351-353, 1 fig. Tests were made with latest type Daimler motor truck with universal joint drive, equipped with 45-hp. motor of 120 mm. bore and 160 mm. stroke. It is concluded that, providing motor is properly adjusted, uninterrupted and comparatively economical operation is possible and formation of soot and oil vapors in exhaust can be completely avoided.

Even if All Country's Coal Were Carbonized in By-Product Recovery Ovens, Amount of Benzol and Its Homologues Recoverable Would Supply Only Small Percentage of Motor Fuel Used. Am. Gas Eng. Jl., vol. 112, no. 23, June 5, 1920, pp. 443-445. Gas Oil Committee of Am. Gas Assn. outlines oil situation, stating prospect of immediate relief and outlook for future.

Result of the 10,000 Miles Benzol Test. Autocar, vol. 43, no. 1260, Dec. 13, 1919, pp. 1105-1107, 2 figs. Test was made to determine whether benzol of N. B. A. specifications does or does not result in deleterious effect upon engine.

Combustion of, Regulation. Combustion of Fuels in Internal-Combustion Engines, C. F. Kettering. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 224-227. Regulating combustion by addition of chemicals to fuels. It is visualized that if, for example, automotive industry could get chemical industry to increase coal-tar production of country, enabling aniline to be sold at $2 per gal., and automotive industry would use 1 per cent, then compression of automobile engines could be raised to 100 lb. and thus efficiency of normal running almost doubled.

Composite Blends. Composite Fuels, Joseph E. Pogue. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 47-48. Possibilities of developing composite fuels or blends for internal-combustion engines are pointed out.

Efficient Utilization. Report on the Utilization of Present Fuels in Present Engines. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 25-29, 6 figs. Committee report presented at semi-annual meeting of Society of Automotive Engineers. Question of mixture giving best distribution and most complete combustion, design of manifolds, condensation of fuel and application of heat are taken up.

Evaporation Speeds. Fuels for Motor Vehicles (Ueber Fahrzeugmotorenbetriebsstoffe), O. Dommer. Oel- und Gasmaschine, vol. 16, no. 4, July 1919, pp. 49-50. Table showing evaporation speed of benzol, benzine, kerosene and alcohol.

Gas. Use of Gas as Automobile Fuel, A. Grebel. Gas Age, vol. 45, no. 10, May 25, 1920, pp. 448-449. Translation from Le Génie Civil describing progress made in Europe.

Gasoline Mixtures. Meeting the Combustion Requirements of Present Fuels. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1445-1447 and p. 1449, 6 figs. Preparation of proper combustible mixtures from less volatile gasolines, with notes on vaporization and distribution. Report of Fuel Committee of Automotive Engrs.

Gasoline vs. Kerosene. Comparison of Kerosene and Gasoline for Heavy Duty Engines, P. S. Tice. Automotive Industries, vol. 43, no. 3, July 15, 1920, pp. 111-113, 5 figs. Results of several tests. It is concluded that carburetor and manifold changes would make present engine suitable for heavier fuels.

Germany. German Government Will Create Standard Motor Fuel, Benno R. Dierfeld. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 501-506. Results of scientific reference on fuel studies of German cars carried on by German chemists and engineers. As outgrowth of these experiments German Government has decided to create standard fuel, which is to consist of mixture of very heavy hydrocarbons with such lighter products as gasoline and benzol.

Heavy Fuels. Notes on the Use of Heavy Fuel in Automotive Engines, H. M. Crane. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 147-148. Discusses briefly fuels of different grades and design requirements to secure good results.

Hydroaromatic. Possible Sources of Home-Produced Motor Spirit, E. de Barry Barnett. Chem. Age (Lond.), vol. 3, no. 64, Sept. 4, 1920, pp. 254-255. Suggests hydrogenation of aromatic bodies so as to yield hydroaromatic fuels of low density.

Ignition Temperatures. Ignition Temperatures of Engine Fuels, Harold Moore. Gas World, vol. 72, no. 1857, Feb. 21, 1920, pp. 156-157. Formula is given for calculating temperature resulting from compression of gas under adiabatic conditions, and list is presented of observed spontaneous ignition points of substances tested. From paper before Instn. of Petroleum Technologists.

Kerosene. Paraffin as Fuel, Edward Butler. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 12-13, 6 figs. Carburetor in which mixture is heated before being supplied to cylinders. In order to start engine is given preliminary run on gasoline.

Utilization of Fuels in Internal-Combustion Engines (Note sur l'utilisation des combustibles dans les moteurs), André Guilleux. Technique Automobile et Aérienne, vol. 10, no. 110, 1920, pp. 82-91, 14 figs. Possibilities of utilizing other fuels than gasolene in automotive engines are discussed. Utilization of kerosene is specially studied.

Mixed. Recent Patents on Mixed Fuels, W. R. Ormandy. Petroleum World, vol. 17, no. 234, March 1920, pp. 103-106. Recent patents are reviewed and nothing new is found in any because, it is said, it is well known that such liquids as kerosene, gasoline, benzol, alcohol, ether, acetone, will either mix in any proportion, or in restricted proportions, and that by admixture of gasoline with benzol a certain amount of alcohol which would not dissolve in

gasoline alone can be caused to dissolve mixture.

Natalite. Fuel for Internal-Combustion Engine. Eng., vol. 109, no. 2822, Jan. 30, 1920, p. 150. Properties of "Natalite," a fuel manufactured at Natal, South Africa, composed of 54 per cent ethyl alcohol, 45 per cent ether, and 1 per cent trimethylamine.

Producer Gas. See PRODUCER GAS.

Safe Storing of. A New Method of Storing and Supplying Inflammable Liquids (Ein neues Lager- und Förderverfahren für feuergefährliche Flüssigkeiten), George Urff. Automobil-Rundschau, vol. 19, no. 7-8, Apr. 1920, pp. 71-75, 1 fig. Safety apparatus for storing and handling gasoline and other inflammable automobile fuels in garages.

Spontaneous Ignition Temperatures. Spontaneous-Ignition Temperatures of Liquid Fuels, Harold Moore. Automobile Engr., vol. 10, no. 138, May 1920, pp. 199-204, 14 figs. Results of experimental measurements of temperatures of spontaneous ignition for kerosene-creosote mixtures, petrol-xylol mixtures, ether-xylol, ether-kerosene mixtures, petrol-benzole mixtures, and cannel oil-creosote mixtures.

Utilization. Some of the Factors Involved in Fuel Utilization, P. S. Tice. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 190-194, 7 figs. Effect of charge structure on engine performance; conditions in the cylinder; engine performance.

Volatility, Measure of. A New Instrument for Measuring Vapour Tension, Harold Moore. Jl. Soc. Chem. Industry, vol. 39, no. 6, March 31, 1920, pp. 78T-80T, 4 figs. Apparatus consists of two tubes of about ¼-in. bore and about 800 mm. long connected to each other and to leveling bottle by means of Y-piece and thick-walled rubber tubing. In one of tubes small amount of motor fuel to be measured is introduced and its vapor pressure is computed by comparing scale readings in both tubes under suitable positions of leveling bottle.

[See also AEROPLANE ENGINES, Fuels; ALCOHOL; BENZOL; GASOLINE.]

AUTOMOBILES

Acceleration Curve. Acceleration of the Automobile and Its Measurement, P. M. Heldt. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1329-1333, 9 figs. Writer shows how to plot acceleration curve of cars not yet built, giving necessary formulæ. Notes on the Wimperis accelerometer and method of using instrument; relation between acceleration, distance and time, etc.

Air-Propeller-Driven. Air Drive for Motor Cars. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 168-169, 1 fig. The Helica, a novel type of automobile driven by airplane propeller. Translated from Nature (Paris).

"Helica"—An Automobile Operated by a Propeller (L'Hélica ou voiture a hélice), E. Weiss. Nature (Paris), no. 2409, June 5, 1920, pp. 305-308, 5 figs. Body of car designed along lines of fuselage. Four-bladed propeller rotated by 8-hp. two-cylinder V-engine imparts motion to car.

The Air-Propeller Automobile (Das Luftschrauben-Automobil). Allgemeine Automobil-Zeitung, vol. 21, no. 33, Aug. 14, 1920, p. 23, 1 fig. Discussion of its advantages and disadvantages.

Alfa-Romeo. The 25.8 Hp. Alfa-Romeo Car. Autocar, vol. 45, no. 1298, Sept. 4, 1920, pp. 411-412, 6 figs. Particulars: Four cylinders, 102 mm. x 130 mm.; magneto ignition; disk clutch; four-speed and reverse gear box; bevel-driven rear axle; semi-elliptic springs.

Aluminum Parts. Machining Aluminum Automobile Parts. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 115-119, 9 figs. Machining operations performed in construction of Essex car built by Hudson Motor Car Co., Detroit, Mich.

Alvis. The 10.7 h.p. Alvis Sporting Car. Autocar, vol. 44, no. 1279, April 24, 1920, pp. 751-754, 7 figs. Specifications: 10.7 hp., four cylinders, 65.8 x 110 mm. bore and stroke; valves in line on one side; engine and gear box carried separately; four-speed and reverse gear box; open propeller shaft; straight-tooth bevel final drive; semi-elliptic springs, front and rear.

American-Made. English Comment on the American Made Automobile. Automotive Industries, vol. 42, no. 24, June 10, 1920, p. 1359. Review of series of criticisms published by British writer upon design and performance of cars manufactured in this country.

Technical Data Concerning the 1920 Models of American Automobiles (Technische Angaben über amerikanische Personenautomobile 1920). Motorwagen, vol. 23, no. 16, June 10, 1920, pp. 282-287. Tabular data on bore and stroke, horse power, cylinder and valve arrangements, camshaft drive, radiation, lubrication, fuel feed, couplings, speed, wheels, tires, etc.

Angus-Sanderson. The 14.2 h.p. Angus-Sanderson Chassis. Automobile Engr., vol. 10, no. 137, April 1920, pp. 139-144, 18 figs. Characteristics: Engine, four-cylinder monobloc rated at 14.2 h.p.; leather-faced cone clutch arranged in flywheel; three-speed gear box, semi-elliptical springs at front and cantilever springs at rear.

Transmission and Control for Angus-Sanderson Motor Car. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 210-211, 17 figs. Gear gives three forward speeds and one reverse. Gear-box, transmission, back axle and brakes form a single unit and can be assembled without reference to chassis frame.

Apperson. The Eight-Cylinder Apperson. Autocar, vol. 44, no. 1272, Mar. 6, 1920, pp. 425-426, 5 figs. Specifications: 33.8 hp., eight cylinders, 90 deg. V type, 83 by 127 mm. bore and stroke; monobloc cylinders, balanced crankshaft, forced lubrication; single-plate dry clutch; three speeds and reverse; semi-elliptic front springs, three-quarter elliptic underslung rear springs.

Argyll. The New 15.9 Hp. Argyll Car. Autocar, vol. 44, no. 1267, Jan. 31, 1920, pp. 195-196, 2 figs. Specifications: Four cylinders, 80 x 130 mm. bore and stroke; monobloc construction, single sleeve valves, engine and gear box in unit; plunger pump lubrication; four speeds and reverse; semi-elliptic front, cantilever rear springs.

Armstrong-Siddeley. The Armstrong Siddeley 29.5 H. P. Chassis. Automobile Engr., vol. 10, no. 139, June 1920, pp. 222-230, 26 figs. Six-cylinder model. Specifications: Claudel-Hobson carburetor; three forward speeds and one reverse; front axle of H-section and of reverse Lemoine type of steering head; exceptionally light frame with main side members of 0.1 in. in thickness.

Arrol-Johnston. Details of 15.9-Horse-Power Four-Cylinder Motor Car. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 819-821, 19 figs., partly on supp. plate. Engine cooling is by thermosyphon assisted by fan mounted on ball bearings and belt driven from end of camshaft. Another type of 13-hp. made also by Arrol-Johnson is likewise illustrated and described.

Ashton. The 10 H.P. Ashton Car. Auto, vol. 25, no. 23, June 3, 1920, pp. 598-600, 6 figs. Details of a light-weight two-seater which is said to have exceptionally good suspension and transmission.

The 10.5 h.p. Ashton Chassis. Autocar, vol.

44, no. 1278, April 17, 1920, pp. 709-712, 9 figs. Specifications: 10.5 hp. Coventry Simplex engine, 66 mm. x 109.5 mm. bore and stroke; three-speed and reverse gear box, gears always in mesh, dog clutch change; bevel final drive, floating axle shafts; transverse spring suspension.

Assembling. Motor Car Assembling at Hudson Plant. Iron Age, vol. 105, no. 18, April 29, 1920, pp. 1219-1221, 3 figs. Parts enter building separately through doors at convenient points and are assembled, painted and dried on nine parallel conveyor lines.

Assembly Plant. Speed in Production and Economy in Space Possible in Assembly Line, J. Edward Schipper. Automotive Industries, vol. 42, no. 13, March 25, 1920, pp. 766-770, 8 figs. Lay out of assembly plant for Essex cars.

Austin, Manufacture. Machine Tool Practice as Applied to Motor Car Production. Machy. (Lond.), vol. 16, no. 398, May 13, 1920, pp. 164-168, 13 figs. Special fixtures used by Austin Motor Co., Ltd.

Autocrat. The 11.9 H.P. Autocrat. Autocar, vol. 45, no. 1301, Sept. 25, 1920, pp. 533-535, 6 figs. Specifications: Four cylinders, 69 x 100 mm. (1495 cc.), 11.9 hp.; detachable combustion head; magneto ignition; multi-plate clutch; three speeds and reverse; bevel final drive; semi-elliptic front and three-quarter elliptic rear springs.

Automobile Boat. The Miller-Metcalf "Amphyglider." Autocar, vol. 45, no. 1297, Aug. 28, 1920, pp. 373-374, 4 figs. Automobile boat driven by air propeller.

Avro. The Avro Light Car. Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1019-1023, 9 figs. Principal specifications are: 10-hp., four-cylinder, 67 by 95 mm., engine; monobloc cylinders, valves in line, detachable valve caps; plunger pump and trough lubrication; quarter-elliptic front and cantilever rear springs.

Axles. Manufacturing Rear Axles. Machy. (Lond.), vol. 16, no. 416, Sept. 16, 1920, pp. 733-741, 25 figs. Outline of operations performed on some of more important parts of Clark rear axle.

See also Front Axles; Hubs; Rear Axles; Wheels and Axles; AXLES, Machining Methods.

Belgian. Metallurgique Cars in 1921. Autocar, vol. 45, no. 1302, Oct. 2, 1920, pp. 572-574, 5 figs. Specifications: 18 hp., four cylinders 90 x 140 mm.; magneto ignition, three-bearing crankshaft; fabric cone clutch; four-speed and reverse separate gear box; bevel driven, full floating rear axle; semi-elliptic springs.

Bentley. The Three-Litre Bentley. Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1008-1011, 8 figs. Principal specifications are: Four-cylinder, 80 by 149 mm. engine; four valves to each cylinder, dry sump lubrication; four-speed gear box; semi-floating rear axle; semi-elliptic springs.

Benz. German Car Incorporates Unusual Technical Features. Automotive Industries, vol. 42, no. 19, May 6, 1920, pp. 1056-1057, 5 figs. Clutch brake, timing patterns, and wheel puller of Benz car, manufactured at Mannheim, Germany.

Bodies. Body Features at the New York Show, George J. Mercer. Automotive Industries, vol. 42, no. 4, Jan. 22, 1920, pp. 300-305, 11 figs. Points out various refinements and novelties in coach work of models exhibited at Grand Central Palace.

Speeding up Manufacture of Automobile Bodies (Beschleunigte Arbeitsverfahren im Karosseriebau), Dierbeld. Motorwagen, vol. 22, no. 16, June 10, 1919, pp. 284-290, 13 figs. Practical methods for artificial drying of wood. Quick process of painting; dipping process.

Whirls and Eddies. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 167, 168, 2 figs. Suggests applying principles of aeroplane construction to design of automobile body.

Body Design. Automobile Body Design, William Brewster. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 215-218, 5 figs. Such considerations are taken up as size of relative positions of seats and doors, position of extra tires, design of windshield and influence of weight upon design.

Fine Coachwork from British Shops in Lanchester. Automotive Manufacture, vol. 62, no. 1, April 1920, pp. 10-12, 3 figs. Details of vee-fronted sedan called saloon body, on 40-hp. six-cylinder chassis.

Ideas from Abroad for Coach Building. Automotive Manufacturer, vol. 62, no. 1, Apr. 1920, pp. 7-9, 3 figs. Body designs of cars exhibited at Paris, London and Glasgow.

The Trend of Automobile Body Design, George J. Mercer. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 263-270 and (discussion) pp. 270-273. Present tendency is to produce soft straight-line effects. Rounded corners are expected to minimize by using smaller radius.

Body Suspension. Notes on the Suspension of Automobile Bodies (Quelques remarques sur la suspension des véhicules automobiles). Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 18-22, 5 figs. Technical study. Special attention is given to influence of size of wheelbase on suspension. It is established that, within certain limits and other things being equal, the smaller the wheelbase, the more effective the suspension mechanism.

Braking, Four-Wheel. Braking on All Four Wheels, W. F. Bradley. Automotive Industries, vol. 42, no. 7, Feb. 12, 1920, pp. 460-462, 5 figs. Comparison of European and American practices.

Briscoe. New Briscoe Has Notable Production Feature. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 70-73, 10 figs. Features are integral cylinder block and top half of crack case, detachable cylinder heads, balanced crankshaft and pressed steel oil pan.

British, Steam. A 1920 Stanley Steam Car. Autocar, vol, 45, no. 1301, Sept. 25, 1920, pp. 519-522, 8 figs. Specifications: Two cylinders, 4 x 5 in. double-acting engine on rear-axle casing; fire tube boiler; full floating, spur gear driven rear axle; twin water pumps, fuel pump, and engine oil pump driven by rear axle; semi-elliptic front, full elliptic rear springs.

Bugatti. The 1920 Bugatti Models. Auto, vol. 25, no. 28, July 8, 1920, pp. 718-721, 8 figs. A medium-weight chassis with chain drive, capable of extremely high speeds, and a light-weight which is an enlarged and improved edition of the original model.

Castings for. See FOUNDRIES, Ford Motor Co.

Chenard-Walcker. The 15-25 h.p. Chenard-Walcker. Autocar, vol. 44, no. 1268, Feb. 7, 1920, pp. 250-252, 6 figs. Specifications: Four cylinders, 80x150 mm.; two sets of ignition plugs; four-speed gear box; bevel-driven full floating rear axle; semi-elliptic springs.

Chicago Show. See New York Show.

Citroën. See French.

Clement-Bayard. The 12-14 hp. Clement-Bayard. Autocar, vol. 43, no. 1261, Dec. 20, 1919, pp. 1139-1141, 4 figs. Principal specifications are: 12-14 hp., four cylinders, 85 by 115 mm.; accumulator and coil ignition, detachable head; three-speed and reverse gear box unit with engine; full floating bevel-driven rear axle; semi-

elliptic front springs, one transverse rear spring.

Cluley. The 10 H.P. Cluley Light Car. Autocar, vol. 45, no. 1300, Sept. 18, 1920, pp. 481-483, 8 figs. Specifications: 10 hp., four cylinders, 62 x 110 mm. (1,328 c.c.); forced lubrication; inverted Ferodo-faced cone clutch; three-speed and reverse gear box, unit construction; bevel-driven, full-floating rear axle; semi-elliptic springs, front and rear.

Clutches. Levers Used to Multiply Spring Pressure in Clutch. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, p. 661, 3 figs. Springs are mounted directly on master ring and pressure is exerted on levers also carried on master ring.

Machining Clutch Parts on Turret Lathes. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 156-159, 11 figs. Tooling equipment used in plant of Borg & Beck Co., Chicago, Ill., for machining automobile clutches.

To Obtain Progressive Clutch Engagement. Autocar, vol. 43, no. 1261, Dec. 20, 1919, p. 1156, 2 figs. Proposed attempt to adopt Fall type of clutch, used in rolling machines, to automobile service.

Cole "Aero" Eight. The Cole 39-80 H. P. "Aero" Eight. Auto, vol. 25, no. 4, Jan. 22, 1920, pp. 93-95, 9 figs. Points of interest are said to be capless reclusion of valves beneath detachable heads, fuel delivery through induction bridge, centralized water exits, mounting of Delco dynamo unit for lighting and ignition and control connection through cylinder-block to carburetor and distributor-sleeve.

Columbia. The 20-38 hp. Six-Cylindered Columbia. Auto, vol. 25, no. 9, Feb. 26, 1920, pp. 234-236, 7 figs. Component-assembly car with thermostatically-controlled cooling system.

Commonwealth. The 20 hp. Commonwealth. Autocar, vol. 44, no. 1268, Feb. 7, 1920, pp. 259-260, 3 figs. Specifications: Four cylinders, 89x127 mm.; three-bearing crank-shaft; three-speed and reverse gear box; full floating bevel-driven rear axle; semi-elliptic springs.

Comparison of, Formula for. "K" up to Date. P. A. Poppé. Autocar, vol. 64, no. 1269, Feb. 14, 1920, pp. 283-286, 1 fig. Writer explains how comparatively simple variations from and additions to original "K" formula can be used to give definite comparisons between cars of varying efficiency designs.

Construction Details. Chassis Details of New Models Point to Design Improvement, J. Edward Schipper. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 512-513, 6 figs. Based on analysis of details of construction as seen at 1920 shows.

Crossley. The Crossley 25-30 H. P. Motor Car. Engineering, vol. 108, no. 2809, Oct. 31, 1919, pp. 596-597, 5 figs. Engine has four cylinders which are cast in pairs and are 101.6 mm. in diameter by 140 mm. strike. Crank shaft is of five-bearing type.

Crown. The Crown "Magnetic" Car. Autocar, vol. 44, no. 1279, April 24, 1920, pp. 759-762, 10 figs. Specifications: Six cylinders, 102 x 140 mm. bore and stroke; overhead valves, forced lubrication, no clutch; electrical transmission; full-floating helical-toothed bevel rear axle; semi-elliptic springs.

Darracq. See French.

Day-Leeds. The 10 h.p. Day-Leeds. Autocar, vol. 43, no. 1254, Nov. 1, 1919, pp. 731-733, 9 figs. Principal specifications are: 10 hp., four cylinders, 64 x 100 mm.; two-bearing crank-shaft, pump-fed trough lubrication; inverted leather cone clutch; three-speed and reverse gear box; semi-elliptic front and back springs.

Delahaye. The 20-30 hp. Six-Cylinder Delahaye. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 152-154, 7 figs. Specifications: Special inlet passage arrangement; leather cone clutch; four-speed gear box; full floating helical bevel-driven rear axle; semi-elliptic springs.

See also French.

Delaunay-Belleville. The 30-Hp. Delaunay-Belleville. Autocar, vol. 43, no. 1262, Dec. 27, 1919, pp. 1186-1189, 8 figs. Principal specifications are: Six cylinders, 88 mm. by 150 mm.; oil pump driven from crankshaft; multi-disc dry clutch; four-speed and reverse gear box; full floating bevel-driven rear axle; semi-elliptic front springs, semi-elliptic and transverse rear springs.

Design. British Tendencies in Passenger Car Design. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 124-129. Lists are included giving specifications of British and Continental passenger cars.

Car Design and Car Usage, Edgar N. Duffield. Automobile Engr., vol. 9, no. 133, Dec. 1919, pp. 455-459. Question of designing a car with a view to simplifying attention required by operator. Paper read before Instn. Automobile Engrs.

Current Tendencies in Automobile Design, E. de Normanville. Engineer, vol. 128, no. 3330, Oct. 24, 1919, pp. 406-409, 7 figs. Remarks on designs exhibited at Olympia, England. Tyler and Napier engines are particularly considered as exemplifying recent progress.

Design of the Forward Part of the Automobile, George J. Mercer. Automotive Industries, vol. 42, no. 4, July 22, 1920, pp. 158-160, 2 figs. Method for making preliminary layout and establishing a base from which final decisions can be formulated.

Influence of Roads on Heavy Vehicles, W. D. Williamson. Motor Traction, vol. 29, no. 769, Nov. 26, 1919, pp. 510-513, 5 figs. Limitations put on design, construction and use of heavy gasoline vehicles by nature and condition of roads. Paper read before Roads and Transport Congress.

Trend in Passenger Car Design, P. M. Heldt. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 114-117, 11 figs. Points out such changes as slight falling off in eight- and twelve-cylinder engines, decline of T-head type engine, continued decline of gravity fuel feed and almost complete disappearance of dual ignition system.

Diatto. The 25 H.P. Diatto. Auto, vol. 25, no. 35, Aug. 26, 1920, pp. 889-891, 8 figs. Conventional Italian design, having four-cylindered monobloc engine, separate four-speed gear-box, and unified back axle and propeller-shaft casing.

Drag Link. Development of the Drag Link Results in Many Improvements, V. A. Davisson. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 956-958, 9 figs. Developments are replacement of brazing by electric welding, adaptation of cap socket for heavier cars, and improvements of grease cup.

Drive Shafts. Electrically-Heated Tubing for Automobile Drive Shafts. Automotive Manufacturer, vol. 62, no. 1, April 1920, pp. 21-23, 3 figs. Method of heat-treating developed by Snead & Co. Electric current of low voltage and high amperage is employed to heat tubing by its own internal resistance.

Dynamotor for. A Flywheel Dynamotor. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 156-157, 2 figs. Bowman-Aspden device combining dynamo, starting motor and flywheel.

Electric. See Steinmetz Electric.

Electric Generators. See ELECTRIC GENERATORS, D. C., Automobile.

Electrical Equipment. The Electrical Equipment of Motor Cars—I. Engr., vol. 129, no. 3354, Apr. 9, 1920, pp. 366-368, 13 figs. Types exhibited at Olympia automobile show.

Enfield-Allday. Enfield-Allday 10-H. P. Motor Car with Air-cooled Engine. Engineering, vol. 108, no. 2810, Nov. 7, 1919, pp. 618, 626-628, 18 figs. Adaptation of radical air-cooled engine is said to have given power unit which weighs less than 1 cwt. and can develop over 30 hp. at 2500 r.p.m.

Many Novel Ideas in Enfield-Allday Light Car. Automotive Manufacturer, vol. 61, no. 10, Jan. 1920, pp. 7-10, 6 figs. Details are: Motor type, air-cooled, radial; cylinders, five, stationary; maximum power and speed, 26.6 at 2,500 r.p.m.; pistons, slipper type; piston material, cast aluminum; rings, four, very narrow; crankshaft, single throw, built up; valves, concentric sleeves; cylinder heads, removable, six bolts.

Engines. See AUTOMOBILE ENGINES.

Export Trade. See EXPORT TRADE, Automobiles.

Fiat. Fiat Has Six and Two Four Cylinder Models. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 754-755 and 781, 5 figs. Changes from pre-war practice by Italian maker are said to include adoption of detachable head, semi-floating rear axle, lighting and starting system and detachable steel wheels.

Ford, Parts Production. Ford Mult-au-matic Practice. Machy. (Lond.), vol. 15, no. 384, Feb. 5, 1920, pp. 578-586, 12 figs. Practice of Ford Motor Co. in machining automobile parts on Bullard Mult-au-matics.

Frames. A Special Fixture for Milling Rails for Automobile Frames, R. A. Wilson. Am. Mach., vol. 52, no. 26, June 24, 1920, pp. 1353-1354, 4 figs. Tells how a standard machine, by use of a special fixture, was adapted to large-scale production work upon one part of an automobile frame, method making use of a "floating arbor" for holding cutters.

French. A Post-War Review of French Automobile Trend, W. F. Bradley. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 902-908, 7 figs. Influence writer believes American practice has had on French design.

France Has Potential Production of 200,000 Cars a Year, W. F. Bradley. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 811-813. Visualizing competition that may be expected from French companies when they reach full swing output. France, and Italy as well, in writer's belief, will make many more cars than before the war, thus becoming stronger factors in field of international sales.

New French Automobiles (Neue französische Personenkraftwagen), R. Bussien. Motorwagen, vol. 23, no. 21, July 31, 1920, pp. 380-391, 33 figs. It is claimed that the new French types show great similarity to the American and that many of their main construction features are taken from American practice. Details of the 10-hp. Citroën, the 12- to 16-hp. Vermorel, the Delahaye 6-cylinder, and the 8-cylinder Darracq car.

Front Axles, Machining of. Machining Front Axles, Fred H. Colvin. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 553-555, 8 figs. Operations applied by Columbia Axle Co., Cleveland, Ohio.

Fuels for. See AUTOMOBILE FUELS.

Garages. See GARAGES.

Gear Boxes. A New Gear Box. Automobile Engr., vol. 10, no. 138, May 1920, pp. 205-206, 6 figs. Gear box giving four speeds forward and reverse introduced by Campbell Transmission Co., Buchanan, Mich.

Machine Tool Practice as Applied to Motor Car Production. Machy. (Lond.), vol. 16, no. 403, June 17, 1920, pp. 317-321, 4 figs. Practice of machining gear-box casting at works of Austin Motor Co., Ltd.

Gears. See GEAR CUTTING, Double Helical Bevel Gears; GEARS, Automobile; Manufacture.

Gears, Change-Speed. Basic Principles Governing the Construction of Change-Speed Gears for Motor Cars and Description of a New Gear (Grundsätze über den Bau von Wechselgetrieben für Motorwagen und Beschreibung eines neuen Getriebes), H. v. Soden. Motorwagen, vol. 23, nos. 20 and 21, July 20 and 31, 1920, pp. 357-360 and 377-380, 8 figs. States that the dissimilarities in change-speed gear constructions are not based on necessity, and that it is possible to employ a unit construction for all cases in motor car work provided it is carried out in different sizes. Gives description of a gear developed according to described principles.

German. See Mercedes.

Glasgow Show. The Scottish Motor Show. Autocar, vol. 44, no. 1267, Jan. 31, 1920, pp. 204-209, 12 figs. Particulars of principal exhibits.

Glass Uses in. Glass and Its Unstudied Problems in Automotive Construction, William Crawford Hirsch. Automotive Industries, vol. 43, no. 9, Aug. 26, 1920, pp. 426-429. Calls attention to design, economic production and greater safety in use of glass as virgin field for research and standardization.

G. N. Air-Cooled. The Air-Cooled G. N. Autocar, vol. 43, no. 1260, Dec. 13, 1919, pp. 1122-1123, 4 figs. Principal specifications are: 90 deg. V twin air-cooled engine, 84 x 98 mm. bore and stroke; disk clutch; three-speed and reverse gear.

Great Britain, Demand in. Britain Demands Light Two- and Four-Passenger Small Engine Cars, M. W. Bourdon. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 505-508, 10 figs. Writer predicts that 50 per cent of British passenger cars will soon be of such manufacture at prices ranging from $700 to $2400.

Guy. The Eight-Cylinder 20-hp. Guy. Autocar, Oct. 25, 1919, pp. 652-655, 11 figs. Specifications: 20 hp.; two blocks of four cylinders each, set at 90 deg.; four-speed and reverse gear; long semi-elliptic springs, rear underslung.

Haynes Six. The Six-Cylinder Haynes. Autocar, vol. 44, no. 1265, Jan. 17, 1920, pp. 99-102, 6 figs. Specifications: Three-bearing crankshaft; three-speed gear box; three-quarter floating bevel-driven rear axle; semi-elliptic springs.

Headlights. Anti-Dazzle Device. Autocar, vol. 44, no. 1263, Jan. 3, 1920, pp. 16-17, 4 figs. Various devices are illustrated. Preventing any of beams of lamp to shine into person's eyes is mentioned as principle of practically all anti-dazzling devices.

Control of Head Lamps, Chester S. Ricker. Autocar, vol. 44, no. 1287, June 19, 1920, pp. 1132-1134, 4 figs. Survey of experiments in United States. In particular reference is made to system whereby small bellows operated by suction of engine is employed to tilt reflector.

Improving the Mazda Automobile Headlight Lamp, L. C. Porter. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 67-71, 19 figs. Process of manufacture.

Motor-Car Headlights and Rearlights in Relation to Traffic Requirements, J. W. T. Walsh.

Illuminating Engr., vol. 13, no. 4, April 1920, pp. 114-118 and (discussion) 118-130, 7 figs. Takes up such questions as headlight beam, scattered light, minimum illumination, minimum spread, colored headlights, etc.

Report of Committee on Automobile Headlighting Specifications. Trans. Illuminating Eng. Soc., vol. 14, no. 9, Dec. 31, 1919, pp. 500-502 and (discussion) pp. 502-511. Specifications for tests of headlights.

Hispano-Suiza. High Priced Six Cylinder Is New Hispano-Suiza Model. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 868-870, 6 figs. Notable features are three speed gear box and front wheel brakes.

Horstmann. The 10.4 h.p. Horstmann. Autocar, vol. 44, no. 1286, June 12, 1920, pp. 1089-1092, 7 figs. Specifications: 4 cylinders, 65 by 100 mm., horizontal valves, detachable head; single-plate fabric-faced clutch; three-speed and reverse gear box with back axle; semi-floating, bevel-driven rear axle; cantilever springs front and rear.

Hubs. Hub Standardization Is Getting Under Way, J. Edward Schipper. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1391-1393. Diagram of work to be undertaken by committee of Automotive Metal Wheel Assn.

Starting the Standardization of Hub and Axle Design, J. Edward Schipper. Automotive Industries, vol. 42, no. 18, April 29, 1920, pp. 993-996, 4 figs. How standardization may be handled is pointed out and reasons are given why problem should be attacked immediately.

The Need for Standardization of Hub Designs, J. Edward Schipper. Automotive Industries, vol. 42, no. 14, April 1, 1920, pp. 793-795, 2 figs. Plea for more simplicity in production of hub parts as remedy to eliminate large losses to equipment makers, car manufacturers and owners, resulting from present multiplicity of such designs.

Humber. Two Chassis Models on the Humber 1920 Program, M. W. Bourdon. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1250-1252, 3 figs. Model of 15.9-hp. differs from pre-war model principally in details of engine, clutch and gearset; 10-hp. model is practically pre-war model and is built for both two-seated or four-seated body use, with wheels, wheel-base and track changed.

Isotta-Fraschini. The 35.8 H. P. 8-Cylindered Isotta-Fraschini. Auto, vol. 25, nos. 38-39. Sept. 16-23, 1920, pp. 962-965, 10 figs., and 990-992, 4 figs. Particulars of Italian type of car.

The 50 hp. Eight-Cylinder Isotta-Fraschini. Autocar, vol. 44, no. 1265, Jan. 17, 1920, pp. 105-108, 8 figs. Specifications: Multi-disk clutch; three-speed gear box; full floating bevel-driven rear axle; semi-elliptic springs.

Italian. See Fiat; Isotta-Fraschini.

Kennedy Axle, Internal Gear. Internal Gear of Kennedy Axle Immersed in Oil. Automotive Industries, vol. 41, no. 23, Dec. 4, 1919, pp. 1114-1115, 3 figs. New specifications are said to be form of construction that keeps internal gear and pinion immersed in bath of oil, and provision for torque shock absorption.

King. Features of the Latest Eight-Cylinder King. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 159-160, 5 figs. Specifications: Mechanically-operated tire pump; fabric-lined plate clutch; three-speed gear box; spiral final drive.

Lafayette. Eight-Cylinder Automobile Has Light Weight Feature, J. E. Schipper. Automotive Industries, vol. 43, no. 8, Aug. 19, 1920, pp. 356-362, 7 figs. Total weight is 2574 lb., engine is 3¼ x 5¼ in., cast in two blocks of four, with detachable heads. Blocks are set at angle of 90 deg. and valves which are located in V are set at angle of 90 deg. to axis of cylinder. Crankshaft is 2¼ in. in diameter, of five-bearing type and weighs 30½ lb. Springs are semi-elliptic, front being 42 x 2¼ in. and rear 60 x 2½ in.

Lanchester. New Features in 1920 Lanchester Model. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 18-20, 7 figs. Fitted with six-cylinder overhead valve engine, 4 in. by 5 in.

The New 40 H. P. Lanchester Chassis. Automobile Engr., vol. 11, no. 141, Aug. 1920, pp. 311-318, 1 fig. Engine is six cylinder overhead valve type with 4 in. by 5 in. bore and stroke. Cylinders are formed in two blocks of three. Front axle of H-section and of reversed Elliott type of steering head is employed. Underslung semi-elliptic springs are used in front and cantilever springs at rear.

Lancia. Lancia Produces a Novel Twelve Cylinder Model. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 862-864, 5 figs. Cylinders are block casting with angle of only 22 deg. between two rows, one row being offset in relation to other so that connecting rods are side by side.

Lighting and Equipment. Lighting and Equipment Laws of Various States. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1164-1165. Tables showing general features of State laws relating to headlights, dimmers, spotlight, turn or stop signals and mirrors for motor vehicles.

See also Headlights.

Lighting and Starting. British Adaptation of Starting and Lighting Equipment, F. H. Hutton. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1002-1004, 5 figs. Analysis of equipment in 1920 cars exhibited at Olympia show.

A Single Unit Starting and Lighting System Developed in France. **Automotive Industries,** vol. 41, no. 26, Dec. 25, 1919, pp. 1257 and 1260, 4 figs. Essentials of Dynastart which is combined generator and starter having both shunt and series field winding.

Lincoln. Lincoln Car Has an Eight-Cylinder, 60 Deg. Vee Engine, J. Edward Schipper. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 554-557, 10 figs. This innovation permits use of smaller hood and gives radial rotating force of constant magnitude instead of horizontal reciprocating force.

Lorraine Dietrich. Lorraine Dietrich Builds Low-Priced Six Cylinder. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 860-861, 5 figs. Car designed for quantity production.

Machining Methods. Machining Methods in Pierce-Arrow Shop, Fred H. Colvin. Am. Mach., vol. 53, no. 5, July 29, 1920, pp. 221-225, 15 figs. Fixtures used for construction of trucks and passenger cars.

Machine Tool Practice as Applied to Motor Car Production—The Austin Motor Co., Ltd. Machy. (Lond.), vol. 16, nos. 399 and 400, May 20 and 27, 1920, pp. 196-201 and 240-243, 16 figs. Notes on machining the front-axle member, and power unit of Austin 20 car. It is stated that there are 30 operations on bottom half of crankcase and 28 operations on top half, details of which are given in two charts, and particulars of the machining which concerns the two halves when assembled together are given.

Manufacture. Factory and Operating Practice of the National Automobile Corporation in Berlin-Oberschöneweide (Fabrik und Arbeitsverfahren der Nationalen Automobil-Gesellschaft A.-G. in Berlin-Oberschöneweide), H. Dierfeld. All-

gemeine Automobil-Zeitung, vol. 21, no. 16, Apr. 17, 1920, pp. 19-23, 12 figs. Account of construction and machinery installations of an entirely new plant constructed during war. Details of heating, electric drive, etc. Main machine room is 98 m. long and 60 m. wide, and a new electric individual drive is used for about 2000 machines which, it is claimed, displays undoubted advantages over the customary belt transmission. Notes on material testing department, chemical laboratory, etc.

See also INDUSTRIAL MANAGEMENT, Production Methods.

Marlborough. The 10-16 hp. Marlborough. Autocar, vol. 44, no. 1265, Jan. 17, 1920, pp. 110-111, 6 figs. Specifications: Multi-disk clutch; four-speed gear box; full floating bevel-driven rear axle; semi-elliptic front, three-quarter elliptic rear springs.

Marles Steering Gear. A New Steering Joint. Auto, vol. 25, no. 1, Jan. 1, 1920, p. 25, 2 figs. Operation of Marles steering gear.

The 14-22 H.P. Varley-Woods. Auto, vol. 25, no. 1, Jan. 1, 1920, pp. 21-22, 7 figs. Diagrammatic sketch of Marles steering gear.

The Marles Steering Gear. Automobile Engr., vol. 10, no. 136, March 1920, pp. 111-112, 5 figs. Device consists of pair of cams attached to steering column which make contact with two corresponding rollers on spindle parallel to column, spindle being attached to and rocking about ball bearing crossshaft to which steering side lever is fixed. Account of road test is given.

Marseel. The 10.5 H. P. Marseel. Autocar, vol. 45, no. 1301, Sept. 25, 1920, pp. 547-548, 5 figs. Specifications: 10.5 hp., four cylinders, 66.5 x 110 mm. (1498 cc.); pump lubrication; magneto ignition; three-speed and reverse gear box, separate unit; bevel-driven, full-floating back axle; quarter elliptic springs front and rear.

McKenzie. The 11.9 hp. McKenzie. Autocar, vol. 44, no. 1272, Mar. 6, 1920, pp. 436-437, 2 figs. Specifications: 11 hp., four cylinders, 66.7 by 95.2 mm.; three-bearing crankshaft; three-speed and reverse gear box; semi-elliptic springs.

Mercedes. German Design. Mercedes Cars. Autocar, vol. 45, no. 1299, Sept. 11, 1920, pp. 451-452, 6 figs. Specifications: 28 to 95 hp.; 6 cylinders; overhead valves; magneto ignition; double cone clutch; four-speed and reverse gear box; full-floating rear axle; bevel drive; semi-elliptic springs.

Military Transport. Delage Offers the Only Car Built for Military Service. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 960-963, 8 figs. Unit construction with 6-cylinder engine and gear-box. Noted feature is great accessibility, there being no obstructions to reaching valve stems.

Military Transport Chassis. Military Transport Chassis. Automobile Engr., vols. 9 and 11, nos. 132 and 142, Nov. 1919 and Sept. 1920, pp. 391-394, 6 figs., and 355-357, 7 figs. Performance of Hallford chassis type E. I. F. 100 under war conditions.

Nash. The Nash Six-Cylinder 29.5 H. P. Car. Auto, vol. 25, no. 15, April 8, 1920, pp. 384-386, 7 figs. Distinguishing feature is said to be spring-loaded sleeve device concentric to hollow shackle pins, which is claimed to enable ordinary gear-oil to be used and to facilitate maintenance.

New York Show. Mechanical Tendencies Revealed at Grand Central Palace, P. M. Heldt. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 59-61 and 73, 11 figs. Writer notes increase in use of flexible disk type universal drive, gain of transmission brakes, increased depth of frames and lowering of them to obtain lower center of gravity and development of force lubrication system.

New York Show Promises Big Business, Darwin S. Hatch. Motor Age, vol. 37, no. 2, Jan. 8, 1920, pp. 7-17, 22 figs. Notable mechanical and electrical features exhibited at automobile show.

The New York Automobile Show. Autocar, vol. 44, no. 1267, Jan. 31, 1920, pp. 187-194, 19 figs. Features of show, as noted by writer, are great interest displayed in eight-cylinder engines, steady growth in popularity of disk wheel and elaborate arrangements of instrument boards.

The Refinement of Details, Victor Pagé. Sci. Am., vol. 122, no. 1, Jan. 3, 1920, pp. 6-7 and 22, 15 figs. From examination of models exhibited at New York and Chicago automobile shows, writer concludes that trend of design for 1920 shows no radical changes but many improvements to mechanism and bodies.

New Zealand Market. See EXPORT TRADE, Automobiles.

1920 Cars, Data on. 1920 Passenger Automobiles Listed with Their Technical Specifications. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 118-123. Over 120 cars are listed, and specifications refer to systems of lubrication, carburetion, ignition, electric system, transmission, nature of running gear, type of bearings, etc.

Olympia Show, London. Motor Car Show at Olympia. Engineer, vol. 128, nos. 3333, 3334 and 3335, Nov. 14, 21 and 28, 1919, pp. 479-484, 15 figs., 512-514, 8 figs., and 530-532, 4 figs. Exhibition is said to have been noteworthy "for the début of the air-cooled radial engine applied to motor cars" and "the great growth in favor of the overhead valve for gasoline engines."

The Motor Car Show at Olympia. Engineering, vol. 108, no. 2811, Nov. 14, 1919, pp. 658-661, 14 figs. Trend of design.

Overland. Overland-4 Design Has High Production Merit. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 704-708, 9 figs. Spring suspension, which by overhang extends distance between spring supports to 130 in. on 100-in. wheelbase, is noted as radical change made from usual practice.

Owen Magnetic. The Entz Electric Transmission System in the Owen Magnetic Car, F. H. Hutton. Elec. Rev., vol. 85, no. 2196, Dec. 26, 1919, pp. 807-808. System consists of two electrical units, one occupying usual position of fly-wheel and other further aft, placed in usual location of gear box. Feature of transmission is said to be that it provides electric braking which will keep speed of car down to 15 or 20 miles an hour automatically on any gradient.

Paige "Six." Paige Enters 1920 with New Six Cylinder Design, J. Edward Schipper. Automotive Industries, vol. 42, no. 7, Feb. 12, 1920, pp. 446-448, 4 figs. Design has L-head engine of 231 cu. in. displacement.

Palladium. The Palladium Light Car. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 67-70, 12 figs. Friction-driven air-cooled design. Engine is of horizontally-opposed type with nominal output of 10 hp.

Paris Show. Paris Show Indicates Trend toward American Practice, W. F. Bradley. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 751-753 and 773. Automobile exhibition shows among principal changes use of taper bearings, detachable cylinder heads, aluminum pistons, pressed steel axles, unit power plants,

battery ignition and electric lighting and starting.

The Paris Aero Show 1919. Flight, vol. 12, nos. 2 and 3, Jan. 8 and 15, 1920, pp. 35-46. 37 figs., and 63-70, 22 figs. Features of French and Italian types exhibited.

Parts. Ford Mult-au-matic Practice, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 299-308, 18 figs. Practice of Ford Motor Co. in machining automobile parts on Bullard Mult-au-matics.

See also STEEL, HEAT TREATMENT OF, Automobile Parts.

Plywood. Plywood and Its Uses in Automobile Construction, Armin Elmendorf. Jl. Soc. Automotive Engrs., vol. 6, no. 5, May 1920, pp. 299-306, 11 figs. Strength of various species of three-ply panels is given in tabular form and curves are presented showing deflection of ply-wood under various loads. Figures are included showing comparison strength of plywood with various metals and pulp boards.

See also PLYWOOD.

Premier Six-Cylinder. The Premier Six-Cylinder Chassis. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 370-373, 17 figs. Aluminum is used for pistons and cylinder block. Transmission runs on ball bearings, propeller-shaft being driven through Peters self-lubricating universal joints.

Production. The Austin Motor Co., Ltd. Machy. (Lond.), vol. 16, no. 397, May 6, 1920, pp. 125-132, 11 figs. Practice of Austin Motor Co., Ltd., Birmingham, England.

Production Increase. Production Expansion Obtained in the Assembly Track Layout, J. Edward Schipper. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1210-1213, 6 figs. It is said that Hudson Co. has increased its production facilities from 160 to 250 cars daily by rearranging assembly track layout.

Propeller-Operated. See Air-Propeller-Operated.

Radiators. See AUTOMOBILE ENGINES, Radiators.

Rear-Axle Drive. Direct Multiple-Speed Automobile Rear-Axle Drives, H. C. McBrair. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 258-264, 21 figs. Various American and foreign forms of rear-axle drives are illustrated, and relation of gear ratio to horsepower is discussed.

Rear Axle Drive (Hinterachs-Antrieb), Franz Böhm. Motorwagen, vol. 22, no. 20, July 20. 1919, pp. 341-344, 9 figs. Details of spur bevel wheel with sector shaped bent teeth; advantages of Gleason design.

Rear-Axle Housing. A Rear-Axle Housing That Is Different, Fred H. Colvin. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 919-921, 5 figs. Jigs and fixtures are so designed that each one checks work of previous operation.

Rear Axles. Manufacturing Clark Rear Axles, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 801-806, 14 figs. Description of methods used by Clark Equipment Co., Buchanan, Mich., in manufacture of automobile rear axles, including machining operations on dead and live axles, axle housings, brake supports, brake drums and gear cases.

See also Axles.

Rear Lights. See Headlights.

Repairs. Electro-Deposition in Automotive Repair Work, B. H. Thomas. Automotive Industries, vol. 43, no. 9, Aug. 26, 1920, pp. 418-420, 1 fig. Based on practice of British Army overhaul shop.

See also IRON, Electrodeposition of.

Riley. The New 11 hp. Riley. Autocar, vol. 43, no. 1254, Nov. 1, 1919, pp. 727-730, 11 figs. Principal specifications are: 11 hp., four cylinders, 65.8 x 110 mm. bore and stroke; fabric-faced cone clutch; four-speed and reverse gear box; semi-floating bevel driven rear axle; half-elliptic springs.

Rolland-Pilain. Rolland-Pilains for 1920. Auto, vol. 25, no. 12, March 18, 1920, pp. 307-310, 9 figs. Two models of 12-16 hp. and 20-30 hp., both having four-cylindered engines.

The 12-16 hp. Rolland-Pilain. Autocar, vol. 44, no. 1270, Feb. 21, 1920, pp. 326-328, 5 figs. Specifications: 12-16 hp., 4 cylinders, 70 x 125 mm.; crankshaft held in lower portion of crank case, timing gears at the rear of engine; leather cone clutch; four-speed and reverse gear box; bevel-driven semi-floating rear axle; semi-elliptic springs.

Rouston Hornsby. The 15.9 hp. Rouston Hornsby. Autocar, vol. 43, no. 1253, Oct. 25, 1919, pp. 646-648, 5 figs. Specifications: 15.9 hp., four cylinders; three-speed and reverse gear box on rear axle; three-quarter elliptic rear, semi-elliptic front springs.

S. A. E. Standardization. S. A. E. Standardization Work in 1919. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 227-242, 29 figs. Progress in aeronautical spark-plug shell dimensions, standardization of sizes of nuts for machine screws prepared in conjunction with Am. Soc. M. E. Committee, revision of leaf springs, additions to list of separable type bearings and standardization of tractor wheels and component parts are among principal developments reported.

Unprecedented Number of Items Before Standards Committee, P. M. Heldt. Automotive Industries, vol. 42, no. 4, Jan. 22, 1920, pp. 314-322. Standards recommended by Soc. Automotive Engrs. Committee on ball bearings, fuel vacuum tank, mounting and connections, spark-plug shells and thread dimensions, dimensions for truck and tractor engine support arms, steel reverse couplings, aluminum alloys, etc.

Schneider. The 14 Hp. Th. Schneider. Autocar, vol. 43, no. 1261, Dec. 20, 1919, pp. 1159-1161, 3 figs. Principal specifications are: 14 hp four cylinders, 83 by 140 mm.; oil level controls ignition switch; leather cone clutch; four-speed and reverse gear box; full-floating bevel-driven rear axle.

The New Th. Schneider Cars (Les nouvelles voitures Ch. Schneider). La vie automobile, vol. 16, no. 706, May 25, 1920, pp. 199-203, 10 figs. Two models: 4-cylinder 30-hp., and 6-cylinder 45-hp.

Scott-Newcomb. See Steam Cars.

Scout. New 15.9 H.P. Scout. Autocar, vol. 45, no. 1301, Sept. 25, 1920, pp. 526-528, 7 figs. Specifications: 15.9 hp., four cylinders, 80 x 130 mm. (2613 cc.); cork inset cone clutch; four-speed gear box (separate unit); bevel-driven, semi-floating back axle.

Shaft Joints. Flexible Shaft-Joint Progress, Carl A. Schell. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 30-32. It is recommended to make total disk thickness about one-eighth of diameter and center hole of disk about 40 per cent of total diameter.

Sigma. The 10 hp. Sigma. Autocar, vol. 43, no. 1260, Dec. 13, 1919, pp. 1117-1119, 6 figs.; also in Auto, vol. 25, no. 4, Jan. 22, 1920, pp. 98-100, 5 figs. French car designed for extreme lightness combined with robust construction for hard service. Principal specifications are: 10 hp., four cylinders, 65 x 120 mm.; Hele-Shaw clutch; four-speed gear box; semi-elliptic springs.

Sizaire-Berwick. The New Sizaire-Berwick. Autocar, vol. 45, no. 1300, Sept. 18, 1920, pp.

487-491, 12 figs. Specifications: 22.4 hp., four cylinders, 95 x 160 mm. (4,536 cc.); balanced crankshaft; hollow connecting rods; four-speed gear box, separate unit; semi-floating back axle, spiral bevels; semi-elliptic front springs, underslung semi-elliptics at rear.

The New 25-50 hp. Sizaire-Berwick. Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1026-1030, 10 figs. Principal specifications are: 25-50 hp., four-cylinder, 95 by 160 mm. engine; four-speed and reverse gear box; full floating helical bevel-driven rear axle; semi-elliptic springs.

The 25-50 H.P. Sizaire-Berwick. Auto, vol. 25, no. 1, Jan. 1, 1920, pp. 10-14, 10 figs. Camera studies of principal external points of design.

Soriano-de Pedroso. The Soriano-de Pedroso. Autocar, vol. 64, no. 1269, Feb. 14, 1920, pp. 298, 2 figs. Specifications: 8.9 hp., 4 cylinders, 60 by 100 mm. (1131 cc.); multi-disk clutch; 3-speed and reverse gear box; semi-elliptic front, quarter elliptic rear springs; 710 by 90-mm. tires.

South African Market. Future of South Africa as an Automotive Market. Automotive Industries, vol. 43, no. 7, Aug. 12, 1920, pp. 326-327. Despite lack of roads and high price of fuel, 30,000 cars are said to be in service in 400,000 square miles of territory, and it is expected that sales will go forward in large numbers as prejudice of farmers is overcome.

South American Trade. American Advertising Possibilities in South America, Allen Sinsheimer. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 84-85. Writer thinks that Chile offers better advertising possibilities for American automobile manufacturer than either Peru or Bolivia. Peculiarities of these countries and advertising methods best suited to each of them are discussed.

Specifications. British Standard Dimensions for Body Spaces and Frame Ends for Chassis for Private Automobiles. British Eng. Standards Assn., no. 100, 1920, 8 pp., 4 figs. Specifications approved in March 1920.

Spring Suspension. Springs and Spring Suspensions, E. Favray. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 49-55, 16 figs. Technical considerations are made of present ordinary types of suspension and method is suggested to provide auxiliary spring, preferably of leaf type, between main spring and axle in order to obtain increased comfort.

Springs. The Correct Anchorage of the Cantilever Spring, M. W. Bourdon. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 902-904, 10 figs. Review of European practice prepared by author after careful study of English models.

Standardization. See S.A.E. Standardization.

Starting. See Lighting and Starting.

Steam Cars. Steam Automotive System, Lewis L. Scott. Jl. Soc. Automotive Engrs., vol. 5, no. 5, Nov. 1919, pp. 353-358, 10 figs. 2 on supp. plate. Describes system developed by author and E. C. Newcomb, as applied to motor car, but which, it is claimed, can also be applied to a motor truck or tractor.

Steam Motor Cars, M. A. S. Riach. Times Eng. Supp., vol. 16, no. 551, Sept. 1920, p. 275. Modern developments.

The Scott-Newcomb Steam System. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 381-383, 4 figs. Advantages of this system for automobile use, as compared with internal-combustion power plant.

Steels for. Selection of Steel for Automobile Parts, N. Julian Thompson. Proc. Steel Treating Research Soc., vol. 2, no. 8, 1919, pp. 13-15 and 24-29. Writer points out that fundamental consideration for selection is that steel ought to be that which is least expensive and at the same time meeting all requirements. He suggests which S. A. E. standards are best qualified for pressings and stampings, bolts, screws, nuts and low-duty parts, keys, balls and cones, general carbonized parts, etc.

The Most Suitable Steels for Automobile Parts, W. H. Hatfield. Automobile Engr., vol. 10, no. 139, June 1920, pp. 245-261, 11 figs. Tables are given in which are indicated the various stresses coming upon different automobile parts, the steels being used or which have been used in their construction, and the steels recommended by the writer as a result of tests and analyses of materials.

See also STEEL, Automobile Steels.

Steering Knuckles. Machining Automobile Steering Knuckles, Ralph E. Flanders. Machy. (N. Y.), vol. 26, no. 10, June 1920, pp. 911-915, 14 figs. Discussion of manufacturing methods and equipment used for obtaining the required accuracy and production.

Steinmetz Electric. Steinmetz Develops New Vehicle Motor System, P. M. Heldt. Automotive Industries, vol. 42, no. 7, Feb. 12, 1920, pp. 458-459, 3 figs. Methods of excitation in which features of series of shunt motors are combined by connecting single storage cell across field winding of series wound motor and of floating cell on line.

Straker-Squire "Six." The 20-25 H.P. Straker-Squire "Six." Auto, vol. 25, no. 1, Jan. 1, 1920, pp. 17-18, 5 figs. Engine has unit valve-gear capping. Lubrication of transmission joint is accomplished by spur-gear pump action of constant-mesh gears and by way of radial holes in attachment unit.

Suère. Suère Eight Cylinder Engine Only 1.77 by 3.54. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 760-761, 6 figs. Shown at Paris exhibit. V-type motor, of two castings, said to have smallest bore for number of cylinders ever built in France, and to have been designed for quantity production.

Talbot-Darracq. The New Talbot-Darracq. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 17-21, 19 figs. Engine consists of two sets of four cylinders arranged at angle of 90 deg. Each set is monobloc casting with detachable head.

Test Engine. Universal Test Engine Produced. Automotive Manufacturer, vol. 62, no. 4, July 1920, pp. 21-26, 8 figs. Design which it is expected will accelerate proper cylinder development and produce reliable scientific data which could be used as basis of future designs.

Three-Wheeled Taxicabs. Three-Wheeled Motor Taxicabs for Berlin (Dreirädrige Kraftdroschken für Berlin). Automobil-Rundschau, vol. 19, no. 5-6, Mar. 1920, pp. 53-54. Because of rapid rise in cost of running motor taxicabs, the Berlin chief of police has been prompted to make a trial of three-wheeled cabs to ascertain whether they met with requirements of traffic safety and if saving effected in rubber and fuel is not counteracted by increased expense of repairs and shorter life of machine. The special regulations for use of these cabs with regard to construction, tariff, etc., are given.

Tires. See TIRES, RUBBER.

Tops. An All-Weather Top for the Open Passenger Car, George J. Mercer. Automotive Industries, vol. 42, no. 20, May 13, 1920, pp. 1106-1108, 4 figs. General shape is different from conventional one in that rear stationary part is of victoria shape.

Transmission Gears for. Machining Automobile Transmission Gears, Ralph E. Flanders. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 644-

647, 8 figs. Description of methods of producing high-quality sliding gears for automobile transmissions.

Transmission, Hydraulic - Wave. Hydraulic - Wave Transmission. Elec. Times, vol. 57, no. 1478, Feb. 12, 1920, pp. 133-134. Comparisons are made between efficiency of wave and electrical transmission and it is pointed out that each has advantages for certain special applications, and the two systems are therefore complementary. It is related that motor vehicle is now being constructed to prove practical application of wave transmission, in which gearbox will be entirely eliminated.

Transmissions. The Strength of Cardan-Shafts, A. Johnson. Automobile Engr., vol. 10, no. 140, July 1920, pp. 266-267, 2 figs. Bending moment and critical length of a shaft is worked out by formulæ.

Turcat-Méry. The 15-25 hp. Turcat-Méry. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1075-1077, 6 figs. Principal specifications are: 15-25 hp., four cylinders, 80 x 150 mm.; leather cone clutch; four-speed and reverse gear box, unit with engine.

Unit, Air-Cooled. A New Air-Cooled Cycle Car. Autocar, vol. 45, no. 1297, Aug. 28, 1920, pp. 377-378, 4 figs. Specifications: 8.9 hp., two cylinders, 85 mm. x 88 mm.; horizontally-opposed, two-cylinder engine; friction gearing; full-floating rear axle; quarter-elliptic springs.

Uses in War. Automotive Vehicles in the Great War, Clarence J. West. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 409-416. Bibliography of important articles in technical journals of United States and other countries relating to use of automobiles and motor trucks.

Voisin. The 25-35 hp. Voisin. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1067-1069, 6 figs. Principal specifications are: 25-35 hp., four cylinders, 95 x 140 mm. bore and stroke; Knight sleeve valves, aluminum pistons; disk clutch; semi-elliptic front, cantilever rear springs.

The 25-35 Hp. Voisin. Auto, vol. 25, no. 22, May 27, 1920, pp. 570-572, 7 figs. Description and illustrations of new touring model, with 4-cylindered chassis on 95 mm. by 140 mm. bore and stroke; it has Treasury rating of 22.4 hp. but actually develops, it is said, as much as 70 hp. at 2000 r.p.m.; wheelbase and track dimensions are 11 ft. 6 in. and 4 ft. 8 in.

War Service. Touring Cars on War Service. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 61-64, 8 figs. Notes on performance of lighter transport chassis.

Welding Parts. See OXY-ACETYLENE WELDING, Automobiles.

Westland Limousine. The Westland Limousine. Aerial Age Weekly, vol. 10, no. 13, Jan. 12, 1920, pp. 495-496 and 499, 4 figs. Principal specifications are: Weight, fully loaded, 2560 lb.; loading, per sq. ft., 8.2 lb.; span, top and bottom planes, 38 ft. 2 in.; height over all, 28 ft. 6 in.

Westwood. The 11.9 hp. Westwood Car. Autocar, vol. 44, no. 1265, Jan. 17, 1920, pp. 115-117, 2 figs. Specifications: Aluminum monobloc engine, overhead valves and detachable cylinder heads; inverted Ferodo faced cone clutch; three-speed and reverse gear box; helical toothed bevel final drive; semi-elliptic front and rear springs.

Wheel Hubs. See Hubs; DIES, Automobile Parts.

Wheel Wabbling. Cause and Cure of Front Wheel Wabbling, A. Ludlow Clayden. Automotive Industries, vol. 43, no. 9, Aug. 26, 1920, pp. 411-414, 4 figs. Account of experiments made with a view to determine best method of eliminating front-wheel wabbling.

Wheels. Indestructible Pressed Steel Double Disc Wheels. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 30-31, 1 fig. Built on triangle principle and equipped with Firestone demountable rim.

Wheels and Axles, Lighter. Decreasing Unsprung Weight by the Use of Aluminum, A. H. Edgerton. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 26-28. Arguments are presented in favor of lighter wheels and axles of motor vehicles.

Wheels, Wooden. Wood Wheels with Pneumatics, Cornelius T. Myers. Power Wagon, vol. 24, no. 188, July 1920, pp. 68-70, 3 figs. Stresses on wheels discussed and advantages of wooden wheels pointed out.

Wolseley. Motor Car Show at Olympia. Engineer, vol. 128, no. 3332, Nov. 7, 1919, pp. 460-462, 8 figs. Particulars of Wolseley cars.

The 20 H.P. Wolseley Chassis. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 346-351, 15 figs. Six-cylinder model. Transmission is by plate clutch and four-speed gear box through open propeller-shaft to underslung worm type of rear axle, Wolseley patented system of floating cantilever suspension being used at rear.

The Wolseley 15 H. P. Chassis. Automobile Engr., vol. 10, no. 138, May 1920, pp. 193-198, 11 figs. Model with overhead valves and camshaft.

Wolseley Cars at Olympia. Engineering, vol. 108, no. 2810, Nov. 7, 1919, pp. 606-609, 21 figs., partly on supp. plate. Three models: 10-hp. 4-cylinder; 15-hp. 4-cylinder and 20-hp. 6-cylinder.

Worm-Gear Drive. Machine Tool Practice as Applied to Motor-Car Production. Machy. (Lond.), vol. 15, no. 380, Jan. 8, 1920, pp. 441-444, 8 figs. Methods of manufacturing Daimler-Lanchester worm-gear drive.

[See also ALUMINUM, Automobile Uses; FERRIES, Automobile; GARAGES; INDUSTRIAL MANAGEMENT, Production Systems; STEEL MANUFACTURE, Automobile Steels.]

AUTOMOTIVE INDUSTRY

Developments. Current Development of Automotive Industries. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 381-386. It is estimated that there is at present potential demand for 2,000,000 cars. Attention is directed to development of detachable-head engines, heating devices for intake manifolds, increased use of semi-floating rear axles and tendency toward pneumatic equipment for trucks having capacities above 2 tons.

Electricity, Uses of. Electricity in the Automobile Industry (Die Bedeutung der Elektrotechnik in Kraftwagenbetrieb), H. Wintermeyer. Elektrotechnischer Anzeiger, vol. 36, nos. 97, 98, 101 and 102, Sept. 11, 14, 21 and 23, 1919, pp. 455-456, 459-460, 475 and 481-482, 10 figs. Advantages are mentioned for electric over gasoline motor. Notes on battery and cell ignition, electric cranking arrangements, etc. Details and illustrations of various types are included.

Export Opportunities. Export Opportunities for Automotive Products. Automotive Manufacturer, vol. 61, no. 7, Oct. 1919, pp. 7-9. Countries where American output can be sold, reasons why they are needed and precautionary methods necessary in selling and delivery.

Internal Combustion Engine Development. See INTERNAL-COMBUSTION ENGINES, Automotive Industry and.

Russian Market and. Russia as a Prospective Buyer of Automotive Products, N. G. Kounetzoff. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 419-421. Writer describes Russian market for automobiles, motor trucks,

tractors and motorcycles as "a large one, capable of development by American manufacturers."

AUTOTRANSFORMERS

See TRANSFORMERS, Autotransformers.

AVIATION

Aerial Lighthouses. Aerial Lighthouses. Flight, vol. 12, no. 5, Jan. 29, 1920, pp. 124-125, 3 figs. Aga marine light. It has four revolving lens panels giving 12 flashes per min., candle-power of each beam being 70,000.

Aerial Navigation. Air Navigation, H. E. Wimperis. Aeronautical Jl., vol. 23, no. 104, Aug. 1919, pp. 445-461, 10 figs. Because long experience of mariner will not apply in upper air and experience has shown insufficiency of available meteorological knowledge of air navigation, need of supporting in every possible way development of really scientific work in meteorology in every part of world, and especially study of physics of upper air is concluded.

The Need for Civil Aerial Transport, W. F. Durand. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1020-1024. Suggestions for establishing system of inspection and classification rules of the road to insure safety in aerial navigation.

Aerial Transportation. Possibilities of Aerial Transport in Peru, G. M. Dyott. Aeronautical Jl., vol. 23, no. 106, Oct. 1919, pp. 521-529, 3 figs. Commercial possibilities offered by reasons of climate, natural resources, geographical position and peculiar topographical configuration.

The Need for Civil Aerial Transport, W. F. Durand. Automotive Industries, vol. 41, nos. 19 and 20, Nov. 6 and 13, 1919, pp. 922-924 and 968-971. Nov. 6: Estimated cost of transportation of express matter by airplane. Nov. 13: Problems of personnel, production and operation.

Air Routes. See Marking Air Routes.

Altitude, Effects of. Some Physical and Psychical Effects of Altitude, Charles Atkin Swan. Aeronautical Jl., vol. 24, no. 109, Jan. 1920, pp. 3-10 and (discussion), pp. 10-14. Writer seeks to prove that most persons can take advantage of aviation as means of transport, and that as they get over seasickness, there is no reason why they should not get over airsickness. Various different conditions which take place at high altitudes, such as low pressure and partial oxygen pressure, etc., are considered.

Some Physical and Psychical Effects of Altitude, Chas. Atkin Swan. Aeronautics, vol. 17, nos. 318 and 319, Nov. 20 and 27, 1919, pp. 468-469, 494-495 and (discussion) 495-496. Causes of discomforts at altitudes above 18,000 ft. and how they can be avoided.

Altitude Flying. The Possibilities of Flying High. Flight, vol. 11, no. 47, Nov. 20, 1919, pp. 1498-1501, 3 figs. Curves showing thrust per hp. at various translational speeds for constant efficiency.

Altitude Measurement. Control and Measurement of Altitude Records (Contrôle et mesure des records d'altitude), Robin. Aérophile, vol. 27, nos. 19-20, Oct. 1-15, 1919, pp. 290-293, 5 figs. Method of measuring altitude by means of barograph and recording thermometer.

Altitude Records. The Valuation of Altitude Records (Zur Wertung von Höhenrekorden), E. Everling. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 9, May 15, 1920, pp. 121-123. States that altitude records should not represent actual distance from earth surface or sea level or a measure of the air pressure, but should represent measure of the density of air. A simple relation between density and altitude is suggested.

Ceiling. See AEROPLANES, Ceiling.

Civil. An Analysis of the Need for Civil Aviation, W. F. Durand. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 872-875. Report to Executive Committee of Nat. Advisory Committee for Aeronautics.

Civil Aviation. Flight, vol. 11, no. 47, Nov. 20, 1919, pp. 1506-1508. Summary of work carried out during last six months by Department of Civil Aviation of Air Ministry.

Commercial. Aerial Transport from a Business Point of View, Sir Sefton Brancker. Aeronautical Jl., vol. 24, no. 114, June 1920, pp. 294-306 and (discussion) 306-312. Also Flight, vol. 12, no. 19, May 6, 1920, pp. 506-510. Discusses organization and equipment required for (1) regular express services; (2) irregular services; and (3) aerial survey. Paper read before Royal Aeronautical Soc.

Commercial Aviation (Exploitation commerciale de l'aviation). Aérophile, vol. 27, no. 23-24, Dec. 1-15, 1919, pp. 365-367, 2 figs. Character of organization of service is visualized and design is presented of aerial port as conceived by the Service de la Navigation Aérienne, France.

Evolution of Aviation from 1914 to 1920 (L'evolution de l'aviation de 1914 a 1920). Aérophile, vol. 27, no. 23-24, Dec. 1-15, 1919, pp. 354-358, 11 figs. It is noted how war stimulated progress, and commercial possibilities of aviation are visualized.

Over-Cloud Flying and Commercial Aeronautics, Melville Jones. Aviation, vol. 8, no. 10, June 15, 1920, pp. 402-408, 6 figs. Comparative study of over-cloud and under-cloud flying for commercial purposes. It is said that under-cloud flying can be successfully performed commercially by individual effort, but always at serious disadvantage compared with over-cloud flying. Latter, however, it is noted, can only be engaged in commercially with assistance of organization on a large scale and with specially constructed apparatus.

Developments in. Developments in Aviation (Aus der Entwicklung des Flugwesens). Schweizerische Bauzeitung, vol. 75, nos. 13, 14 and 15, Mar. 27, Apr. 3 and 10, 1920, pp. 139-144, 155-160 and 170-173, 35 figs. Discussion of the fundamental theory of aviation, followed by details and illustrations of design and construction parts of modern aeroplanes.

Desiderata in U. S. Stimulating the Output of Airplanes in America. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1214-1215. Urges enactment of Federal aviation code, to be followed by concurrent legislation in all of several States, also establishment of air harbors for both land and water craft and development of system of meteorological and radio information for commercial aircraft.

Direction Finders. See DIRECTION FINDERS.

Drag Chart. A Weight, Speed, Altitude and Drag Chart, C. H. Powell. Aeronautics, vol. 17, no. 317, Nov. 13, 1919, pp. 448-449, 2 figs., partly on supp. plate. For calculating drag of aeroplane, but specially it is presented as means of visualizing influence on drag of weight, speed and height.

Federal Code. See Desiderata in U. S.

Flying Sickness. See Altitude, Effects of.

Future of. The Future of Aviation, E. A. Deeds. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 28-31, 11 figs. Writer sees that most necessary development at present is establishment of landing fields and wireless "beacons" which may direct course of aviators in foggy weather. He visualizes some of the developments which will take place in armored planes and aerial torpedoes in future wars.

Hangars. See HANGARS.

High-Altitude Ballooning. Aerial Passenger Travel at High Altitudes, M. Guglielminetti. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 49-51, 2 figs. Nature and causes of altitude sickness are enumerated and designs of closed car for high altitude ballooning and diving units for flights at high altitudes are proposed. Translated from L'Aérophile.

History. Historical Account of Aviation During the War from 1914 to 1918 (Historique de l'emploi de l'aviation), J. Orthlieb. Aéronautique, vol. 1, no. 5, Oct. 1919, pp. 177-179, 3 figs. Aviation during operations at Verdun.

Landing. See AEROPLANES; Landing, Sideslip.

London-Paris Service. Aerial Service between London and Paris (Les transports aériens entre Paris et Londres). Génie Civil, vol. 76, no. 26, June 26, 1920, pp. 577-578. Records of passenger traffic from Aug. 25, 1919, to June 2, 1920. Total of 1,641 passengers and 38,860 kg. of merchandise were transported during that time.

Marking Air Routes. Marking Overhead Lines for Guidance of Aviators (Die Kennzeichnung der Freileitungen für Luftfahrer), G. Dettmar. Elektrotechnische Zeitschrift, vol. 40, no. 37, Sept. 11, 1919, pp. 449-452, 3 figs. Discusses necessity and possibility of doing so and also practical value of suggestions made in this respect.

Naval Air Station, Pensacola. The Naval Air Station at Pensacola, Fred H. Colvin. Am. Mach., vol. 53, no. 5, July 29, 1920, pp. 197-199, 3 figs. Description of equipment.

Navigation Apparatus. See COMPASSES, Gyroscopic, Electrical.

Parachutes. See PARACHUTES.

Passenger Service. See London-Paris Service.

Progress Abroad. Progress of Civil Aviation in Foreign Countries. Aeronautics, vol. 17, no. 323, Dec. 25, 1919, pp. 582-584. Reports of Air Ministry giving account of progress up to Oct. 31, 1919. France, Italy and Germany are represented as "most serious competitors in securing an international aircraft trade."

Radiotelegraphy and. See RADIOTELEGRAPHY, Aviation Applications.

Regulations. See Aerial Navigation Rules.

Releasing Lift. Some Kite-Balloon Experiments, Griffith Brewer. Aeronautical Jl., vol. 24, no. 109, Jan. 1920, pp. 16-32 and (discussion), pp. 32-36, 16 figs. Account of experiments made with a Drachan balloon to ascertain best method of placing at pilot's disposal the power of suddenly releasing about 500 lb. of lift. Writer describes his invention which forms subject of secret patent which he assigned to the Admiralty, and is published with permission of Admiralty.

Strategy in. A Story of the Part Played by Aviation with the British, German and American Fleets, E. O. McDonnell. Flying, vol. 8, no. 11, Dec. 1919, pp. 905-911, 13 figs. Notes particularly comparative value in strategic manœuvers of zeppelins and aeroplanes.

Theory. See Developments in.

Transcontinental Flying. Transcontinental Flying, P. D. Acland. Aeronautical Jl., vol. 24, no. 114, June 1920, pp. 273-288 and (discussion) 289-293. Résumé of principal flights undertaken by British Air Ministry during 1919.

Turn Indicator. See AERONAUTICAL INSTRUMENTS, Turn Indicator.

U. S. Navy. Development of U. S. Naval Aviation. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 424-428, 5 figs. Prepared by Bureau of Naval Operations, Navy Dept.

See also Naval Air Station.

War Progress. The Scientific Progress of Aviation During the War, L. Bairstow. Engineering, vol. 108, no. 2806, Oct. 10, 1919, pp. 493-496, 16 figs. Including graphs indicating comparison of pressure plotting on model and full-scale biplane with Royal Air Force 14 wings, and records of pitching oscillations. Paper read before British Assn. for Advancement of Sci.

Wartime Mortality. Mortality Statistics of the Air. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 190-191. Analysis of war time fatalities of airmen of allied armies, whether incurred during training or in actual combat is given as indicating dangers incurred under abnormal conditions, but it is noted that it is no criterion of events in time of peace.

Weather Conditions, Effects of. Effect of Winds and Other Weather Conditions on the Flight of Airplanes, Charles F. Brooks and others. Monthly Weather Rev., vol. 47, no. 8, Aug. 1919, pp. 522-532, 10 figs. Suggested scientific explanations of phenomena observed in flying.

Explanation of Peculiarities Observed in Flying in the Wind, J. G. Coffin. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 382-385, 9 figs. Technical study of effect of wind gradient.

[See also AERODROMES; AERONAUTICAL INSTRUMENTS; AVIATORS; AEROPLANES; FLIGHT; HELICOPTERS.]

AVIATORS

Clothing, Electrically Heated. Electrically Heated Aviator's Clothing. Aerial Age, vol. 10, no. 12, Jan. 5, 1919, pp. 458-459, 3 figs. Outfit specified by Bureau of Aircraft Production.

Oxygen Supply. A Note on Oxygen Supply for Aviators, G. B. Obear. Air Service Information Circular, vol. 1, no. 3, March 15, 1920, pp. 44-57, 12 figs. Description of various types of oxygen-supply apparatus.

Physiology. Physiological Effects of Insufficient Oxygen Supply, J. Barcroft. Nature (Lond.), vol. 106, no. 2656, Sept. 23, 1920, pp. 125-129. From presidential address delivered at Physiology Section, British Assn. for Advancement of Science.

The Aviator's Heart. Roentgen Ray Studies under Conditions Simulating High Altitudes, Leon T. LeWald, Guy H. Turrell. Air Service Information Circular, vol. 1, no. 3, March 15, 1920, pp. 3-25, 85 figs., partly on 15 supp. plates. Two series of studies were undertaken, one with Henderson rebreather and the other in the low-pressure chamber.

AXLES

Fissures. Cause of Formation of Fissures in Axles (Genèse des fissurations de certains essieux), M. Ch. Frémont. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 20, May 17, 1920, pp. 1161-1164, 2 figs. Fissures are attributed to shocks transmitted by wheel. Shocks, it is explained, originate series of rapid successive rebounds, and when stresses thus developed exceed elastic limit, fissures are formed on opposite side of axle. It is suggested as remedy to fasten axles on springs, instead of rigidly to body of carriage.

Locomotive. See LOCOMOTIVES, Hollow Steel Axles.

Machining Methods. Shop Practice in an Axle Plant. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 166-168, 4 figs. Methods of machining and equipment employed in plant of Timken-Detroit Axle Co., Detroit, Mich., for obtaining high production.

B

BABBITT

See BEARING METALS, Babbitt.

BABBITTING

Bearings. Babbitts and Babbitting, T. D. Lynch. Assn. Iron & Steel Elec. Engrs., vol. 2, no. 6, June 1920, pp. 13-24 and (discussion) pp. 24-38. Also in Blast Furnace & Steel Plant, vol. 8, no. 8, Aug. 1920, pp. 433-436. Account of Westinghouse Co.'s process of babbitting bearings with their lead-base babbitt, which is said to be equally suitable for tin-base babbitt, and which is now being used for production of bearings requiring approximately 40 tons of babbitt metal each month. Process is divided into following subheads, each of which is described: Preliminary machining of shells, cleaning shells, care of tinning alloy, tinning bronze shells, tinning pipe-bearing shells, anchor holes in cast-iron and malleable-iron shells, sizes of mandrels, preheating mandrels, preheating shells, babbitting, peening or rolling, cleaning solutions, materials.

Rebabbitting. Rebabbitting Engine Parts, H. Hamkens. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 383-386, 12 figs. Directions for rebabbitting engine bearings and other parts.

BAGASSE

Furnaces for. See FURNACES, BOILER, Bagasse.

BAKELITE

Cast-Iron Molds for. Cast-Iron Moulds for Bakelite Products. Machy. (Lond.), vol. 16, no. 406, July 8, 1920, p. 427, 4 figs. Plaster patterns are employed in making cast-iron moulds. Description of procedure.

[See also AEROPLANE PROPELLERS, Bakelite-Micarta.]

BALANCING

Crankshafts. See CRANKSHAFTS, Balancing.

Dynamic. Dynamics of Dynamical Balancing (In Japanese), I. Okamura. Denki Gakkwai Zasshi, no. 381, Apr. 10, 1920.

Locomotive Wheels. See LOCOMOTIVES, Wheel-Balancing Machine.

Rotors. The Balancing of Rotors and Determining the Position and Amount of the Balancing Weights, J. J. King-Salter. Shipbuilding & Shipping Rec., vol. 15, no. 14, Apr. 1, 1920, pp. 446-448, 5 figs. Method is described where the rotor is put straight into balancing machine, no prior notice being taken of any static unbalance, both the conditions of static and dynamic unbalance being determined together in one operation. Abstract of paper read before Instn. Naval Architects.

Turbines and Propellers. Balancing of Turbines and Propellers, J. J. King-Salter. Eng., vol. 109, no. 2832, Apr. 9, 1920, pp. 491-494, 14 figs. Also Engr., vol. 129, no. 3354, Apr. 9, 1920, pp. 381-383, 4 figs. Machine for determining amounts and positions of weights required to balance turbine rotors, marine propellers, etc. System of collars with plunger pins passing through them is applied to rotor in such a way that extent to which pins are, after running, found to have been pushed in or out indicates position of out-of-balance weight. Paper gives vibration diagrams of S. S. Niagara, 525 ft. by 66¼ ft. by 34½ ft., 13,415 tons gross, obtained both before and after dynamically balancing center propeller. Paper read before Instn. Naval Architects.

BALANCING MACHINES

Types. Balancing of Rapidly Rotating Masses (Auswuchten raschumlaufender Körper), S. Boothby. Elektrotechnischer Anzeiger, vol. 36, no. 110, Oct. 9, 1919, pp. 522-523. It is set forth that obtaining static and dynamic equilibrium is absolutely essential and by means of careful balancing also practicable. Construction of several balancing machines is described.

BALING PRESSES

Electric. 200-Ton Electric Baling Press. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 92-93, 3 figs. Press is worked by series-wound motor capable of peak output of 300-b.hp. at 230 r.p.m.

BALL BEARINGS

See BEARINGS, BALL.

BALLISTICS

Calculations. Ballistic Calculations, D. R. Hartree. Nature (Lond.), vol. 106, no. 2657, Sept. 30, 1920, pp. 152-154. Methods developed during war for working out range tables and for analyzing trial shoot.

Functions. Functions of Lines in Ballistics, Gilbert Ames Bliss. Trans. Am. Mathematical Soc., vol. 21, no. 2, April 1920, pp. 93-106, 2 figs. Method for computing differentials of functions entering in differential equations describing motion of projectile.

German Long-Range Guns. Some Consideration on the Ballistics of a Gun of Seventy-Five-Mile Range, Arthur Gordon Webster. Proc. Am. Philosophical Soc., vol. 58, no. 6, 1919, pp. 373-381, 4 figs. Technical considerations showing how German gun which bombarded Paris from distance of seventy miles was made possible by taking advantage of decrease in resistance due to decreasing density of air in high altitudes.

Shell Flight. The Dynamics of Shell Flight, R. H. Fowler. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 145-146. Experimental determination of reaction of air on moving shell. From Nature (Lond.).

[See also GUNNERY.]

BALLOONING

High-Altitude. See AVIATION, High-Altitude Ballooning.

BALLOONS

Avorio-Prassone. The Avorio-Prassone Kite Balloon, John Jay Ide. Aviation, vol. 8, no. 8, May 15, 1920, pp. 314-316, 6 figs. This type was used extensively for observation purposes by Italian Army. Gas envelope is ellipsoidal or ovoidal, depending upon model, with major and minor axes differing only slightly in length. Wind resistance of balloon is reduced by air-filled cone attached to rear end of envelope.

Captive. The Principle of the Captive Balloon, P. H. Sumner. Flight, vol. 12, no. 24, June 10, 1920, pp. 619-622, 10 figs. Its application to mooring of airships.

Drachan, Experiments with. See AVIATION, Releasing Lift.

Fabrics for. See AIRCRAFT CONSTRUCTION MATERIALS, Fabrics.

Fires in. Causes and Preventions of Fires in Balloons, W. F. Swann. Sci. Am. Supp., vol. 88, no. 2,285, Nov. 8, 1919, pp. 258 and 280. Con-

clusions based on investigations of fires at various army camps. From U. S. Air Service.

Kite. Some Kite-Balloon Experiments, Griffith Brewer. Aeronautics, vol. 17, no. 320, Dec. 4, 1919, pp. 510-515, 15 figs. Also in Flight, vol. 11, no. 48, Nov. 27, 1919, pp. 1533-1538, 16 figs. Conducted for the purpose of determining best method of placing at pilot's disposal power of suddenly releasing about 500 lb. of lift. Patent is described which is said to permit this operation.

The Caquot Type M Kite Balloon. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 433-436, 3 figs. Length is 85 ft. and greatest diameter 26 ft. 8 in. Volume is about 32,840 cu. ft. Balloon has elongated form with greatest section about one-quarter length from bow.

See also Avorio-Prassone; METEOROLOGY, Kite Balloons; TELEPHONY, Kite Balloons.

Observation. Observation Balloons (L'aérostation d'observation). Aéronautique, vol. 1, no. 5, Oct. 1919, pp. 180-182, 4 figs. Types carried by warships.

Parachutes. See PARACHUTES.

[See also METEOROLOGY, Atmospheric Observation with Balloons.]

BALSA WOOD

Properties. See WOOD PRESERVATION.

BARGES

Canal, Tractors for. See TRACTORS, Schneider.

Coal. See RIVER VESSELS, Coal Barges.

Concrete. Concrete Barge Built by Cement Gun. Compressed Air Mag., vol. 25, no. 3, March 1920, pp. 9582-9583, 3 figs. Barge is 100 ft. long, 20 ft. in width and 6 ft. in depth. It has deadweight of 350,000 lb. and will carry live load of 50 tons.

Construction of Reinforced-Concrete Ocean-Going Barges (La construction des chalands de mer en béton armé), H. deLauriston. Génie Civil, vol. 77, no. 8, Aug. 21, 1920, pp. 145-148, 8 figs. Lezard, first of set being constructed for coal traffic between England and France. Dimensions: Length, 50 m.; width, 10 m.; draught, 5.25 m.; displacement, 1100 tons.

Reinforced-Concrete Barges on the Danube River (Donauschleppkähne aus Eisenbeton), E. Foerster. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 42, Oct. 18, 1919, pp. 1021-1026, 21 figs. Details and illustrations of construction and design of two barges built under army supervision during war. Comparisons between load and bending tests of these boats and of a steel barge of similar dimensions are made and results are presented in curves.

The First Reinforced-Concrete Ship in Hungary (Das erste Eisenbetonschiff in Ungarn), Gerhard Neumann. Beton u. Eisen, vol. 19, no. 1, Jan. 8, 1920, pp. 7-10, 10 figs. Details and illustrations of design and construction of Danube River barge with a displacement of 350 tons at 1.9-m. draft and 500 tons at 2.3-m. draft; overall length of 53.1 m. and width of 8.2 m.

See also SHIPS, CONCRETE, Construction.

Concrete vs. Steel. The Consumption of Power in the Towing of Steel and Reinforced-Concrete River Lighters (Der Kraftverbrauch bei der Schleppung von Flussleichtern aus Eisen und Eisenbeton), Gerhard Neumann. Beton u. Eisen, vol. 19, no. 4-5, Mar. 4, 1920, pp. 49-52, 2 figs. Table is given showing saving of power effected by use of concrete boats instead of under-frame steel barges, in addition to economy in steel and in coal required for fuel.

Mississippi River. River Transportation in the Mississippi Valley, E. W. Schadek. Mech. Eng., vol. 42, no. 5, May 1920, pp. 270-272, 5 figs. Review of recent progress in construction of barges and tow-boats for river transportation, particularly in Mississippi River Section, and of provision made for their operation.

Oil-Tank. Oil Barges (Chalands Pétroliers). Bulletin Technique du Bureau Veritas, vol. 2, no. 5, May 1920, pp. 94-98, 4 figs. Designs operating in French and German rivers.

Ore. Design of Ore Fleet for Upper Mississippi, William S. Mitchell. Mech. Eng., vol. 42, no. 7, July 1920, pp. 379-382, 4 figs. Writer describes two experimental trips which were conducted during the war to try out possibilities of such transportation on Mississippi river. Results of these trips are said to have warranted construction of fleet of 24 barges and 4 towboats for traffic of ore and fuel. Particulars are given regarding design and construction of vessels, and terminal facilities projected.

Propulsion. See SHIP PROPULSION, Airscrew.

Refrigerating. Refrigerating Barges on the Rhine (Rheinkühlschiffe), E. Foerster. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 17-18, May 1, 1920, pp. 341-346, 17 figs. Details of equipment of a large barge for transportation and cold storage of meat, ordered by Inter-allied Army of Occupation and in continuous service at Antwerp since July 1919. Specifications: Overall length, 79.95 m.; beam, 9.48 m.; loading capacity, 1350 tons; engine, horizontal Dingler-Diesel, 36 hp. at 210 r.p.m.; refrigerating machine, 275 mm. cyl. diam. by 175 mm. stroke, 180 r.p.m.

Resistance to Traction. Removable Bow for Diminishing Resistance of Barges to Traction (Avant-bec mobile pour diminuer la résistance des péniches à la traction), M. Vidal. Annales des Ponts et Chaussées, vol. 66, no. 3, May-June 1920, pp. 285-296, 3 figs. Design used in barges operated in Seine river. Results of experiments in which resistance of barge, with and without bow, was measured.

Sea-Going. Seven Thousand-Ton Coal Barges for the Panama Canal. Int. Mar. Eng., vol. 25, no. 3, March 1920, pp. 172-174, 3 figs. Two steel sea-going vessels built by Alabama Dry Dock & Shipbuilding Co., Mobile, Ala., for Emergency Fleet Corporation.

Steel, N. Y. Barge Canal. Steel Barges for the New York Barge Canal. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 400-401, 3 figs. Dimensions: length inside fenders, 150 ft.; beam molded, 20 ft.; depth, 12 ft.; draft, light, aft, 30 ft.; displacement, light, 155 tons; deadweight cargo, 550 tons.

[See also TOW BOATS.]

BARITE

Occurrence. Barytes, M. A. Allen and G. M. Butler. Univ. of Ariz. Bul., Mineral Technology Series, Bul. 99, no. 22, 1919-1920, Aug. 1919, pp. 1-18, 2 figs. Characteristics, occurrences, uses and mining methods. Bibliography of articles which have appeared in scientific magazines is appended.

BAROMETERS

Types. Barometers and Vacuum Measuring Instruments. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 86-87, 10 figs. Descriptions of various types, their construction and principles of operation.

BARYTES

See BARITE.

BASCULE BRIDGES

See BRIDGES, LIFT, Bascule.

BAST FIBER

See ROPE, Bast Fiber.

BATHHOUSES

Chicago. Chicago Municipal Improvements—I and II. Am. Architect, vol. 116, nos. 2284 and 2285, Oct. 1 and 8, 1919, pp. 461-465 and 483-490, 17 figs. Constructional details of bathing pavilion at Jackson Park.

Concrete. Concrete Bath Houses for Brighton Beach, N. Y., Harold Ward Gardner. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 269-273, 9 figs. Precast slab construction.

Vienna. The Machinery and Hydraulic Installations in the New Diana Bath in Vienna (Die Maschinenund Badetechnischen Anlagen in neuen "Dianabad" in Wien), Hermann F. Parmet. Gesundheits-Ingenieur, vol. 43, nos. 19 and 22, May 8 and 29, 1920, pp. 217-224 and 256-260, 12 figs. Description of palatial bath erected during war and said to be unrivaled in every respect. Details of power plant, water filtration plant for swimming pool, laundry plant, ventilation and heating plants, etc.

[See also WELFARE WORK, Bathhouses.]

BATTERIES

Dry Cells. Electrical Characteristics and Testing of Dry Cells. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1011-1029, 9 figs. Describes various kinds of cells that are obtainable, indicates kinds of service for which they are adapted, and outlines methods of testing them. Abstract of Circular 79 of U. S. Bur. of Standards.

Regeneration of Dry Cells. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 41-42. Wet treatment given with glass water jet sprayer through waste gas openings. Translated from Fernsprech Technik.

Relation of Voltage of Dry Cells to Hydrogen-Ion Concentration, H. D. Holler, L. M. Ritchie. Sci. Papers Bur. Standards, no. 364, Feb. 24, 1920, pp. 659-668, 3 figs. Results of experimental work. It is concluded that potential of electrode composed of mixture of graphite and some manganese ores is logarithmic function of hydrogen-ion concentration of solution in contact with electrode, and that potential of similar electrodes containing chemically prepared oxide instead of natural ores is independent of hydrogen-ion concentration. Polarization of dry cell during discharge is explained as being due in part to layer of electrolyte on surface of electrode impoverished in hydrogen-ions.

See also FIRE HAZARDS, Dry-Cell Batteries.

Electrodes, Regeneration of. The Regeneration of Carbon-Manganese Dioxide Electrodes in Wet Cells (Zur Frage der Auffrischung von Kohlenbraunsteinelektroden in Nasselementen), Rob. Nowotny. Elektrochemische Zeitschrift, vol. 26, nos. 5-6, Aug.-Sept. 1919, pp. 45-49. Experiments are said to demonstrate that treatment with sulphuric acid neither effects an oxidation of the exhausted peroxide nor a noticeable improvement in the value of the ratio MnO_2/Mn_2O_3.

Elektromotive Forces. Potentials of the Zinc and Cadmium Electrodes, W. Grenville Horsch. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1787-1800, 3 figs. Measurements of electromotive forces of following cells: Zn : $ZnCl_2$; AgCl : Ag; Cd (amalgam) : $CdCl_2$; AgCl : Ag; Cd (amalgam) : $CdCl_2$; Cd; H2; HC1 (0.01M); AgCl : Ag.

Lead Standard Cell. Further Studies on a Lead Standard Cell, M. G. Mellon and W. E. Henderson. Jl. Am. Chem. Soc., vol. 42, no. 4, Apr. 1920, pp. 676-689, 1 fig. Experiments are related which confirmed previously reported work on constancy and reproducibility of cells containing sodium sulphate. It was further found out that saturated cells containing sulphates of nickel, cobalt, zinc, or manganese are substantially as reproducible and as constant as those containing sodium sulphate. These cells are believed to possess characteristics necessary for standard cell.

New Types. New Galvanic Elements and Accumulators (Neue galvanische Elemente und Akkumulatoren), H. Pradel. Elektrotechnischer Anzeiger, vol. 37, nos. 70 and 72, May 1 and 5, 1920, pp. 301-303 and 315-317, 25 figs. Details of various new processes and devices for construction of small batteries, accumulators, etc.

Nitrates in Acid of. Estimation of Nitrates and Nitrites in Battery Acid, L. B. Sefton. Tech. Papers Bur. Standards, no. 149, Feb. 24, 1920, 19 pp. Methods are recommended which were selected from more than 50 methods in literature as being most suitable and reliable for battery purposes. Selection was made with regard to availability of method for quantitative determinations in ordinary laboratory.

Soda Cells. A Study of the Soda Cell in Plain Language, L. S. Dunham. Ry. Signal Engr., vol. 13, no. 6, June 1920, pp. 253-254. Pointers on maintenance and setting up of cells; importance of solution line and water used; indication of exhaustion.

Standard Cells. A New Form of Standard Cell, C. J. Rodman and Thos. Spooner. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 8, pp. 49-63, 6 figs. Cadmium cell with usual ingredients but having container of hard glass. Instead of common H-type, compact concentric arrangement is employed.

See also Lead Standard Cell.

Storage. See STORAGE BATTERIES.

BATTLESHIPS

See WARSHIPS.

BEAMS

Bending Moments in. See Continuous.

Broad-Flanged. Manufacture of Broad-Flanged Beams with Perfectly Uniform Flanges, A. Schriever. Blast Furnace & Steel Plant, vol. 8, no. 8, Aug. 1920, pp. 437-440, 15 figs. Shows different methods of production of Sack universal mill and working process and construction of cogging and finishing mills.

See also ROLLING MILLS, Sack Universal Mill.

Buckling. The Buckling of Deep Beams, J. Prescott. London, Edinburgh and Dublin Philosophical Mag., vol. 39, no. 230, Feb. 1920, pp. 194-223, 9 figs. In previous paper (Philosophical Mag., Oct. 1918) differential equations for each type of beam were worked out separately. In present paper it is shown that they all come under one general form.

Calculation of Size. Short Cut to Accurate Calculations, E. I. Freese. Am. Architect, vol. 118, no. 2336, Sept. 29, 1920, pp. 416-418, 2 figs. Tables for calculating sizes of timber beams and steel girders.

Concrete. See Reinforced-Concrete.

Continuous. Calculation of Bending Moment in Continuous Beams having Three Supports (Berechnung der Biegungsmomente infolge der Eisenbahnverkehrslast für durchlaufende Träger auf drei Stützen), Kommerell. Zeitschrift für Bauwesen, vol. 69, nos. 7-9, 1919, pp. 550-572, 34 figs. Equations.

BEAMS

Calculation of Continuous Beams Supported on Elestic Columns (Calcul des poutres continues sur piliers élastiques), J.-P.-L. Busset-Schiller. Bulletin technique de la Suisse romande, vol. 46, nos. 16, 17, 18 and 19, Aug. 7, 21, Sept. 4 and 18, 1920, pp. 185-187, 6 figs., 196-199, 210-212, and 220-221, 12 figs. Aug. 7: Technical study; Aug. 21: Derivation of formulæ for computing stresses; Sept. 4: Numerical applications of formulæ; and Sept. 18: Effect of temporary increase.

See also AEROPLANES. Stresses.

Curved. Curved Beams (Ringförmige Träger), Friedrich Düsterbehn. Eisenbau, vol. 11, no. 3, Feb. 17, 1920, pp. 73-80, 16 figs. Deals with certain important and typical cases of beams curved in circular form, and subjected to bending and torsion.

The Calculation of Circular-Curved Beams on Three or More Supports (Beitrag zur Berechnung kreisförmig gekrümmter Träger auf drei und mehr Stützen), H. Kaufmann. Zeitschrift für Bauwesen, vol. 69, nos. 10-12, 1919, pp. 667-683, 26 figs. Review of the most important rules for determination of shearing stress and angle of torsion after torsional moment is known, followed by discussion of a formula by Föppl for calculation of twisting stress of structural-steel sections.

Fixed-End. Notes on the Fixing of Beam and Column Ends (Beitrag zur Einspannungsfrage), Leon Wierzbicki. Armierter Beton, vol. 12, no. 11, Nov. 1919, pp. 265-272, 11 figs. A few examples are given to illustrate action of a straight rod fixed within a homogeneous material and stressed from without, and the compressive strength developed thereby in the material.

Moving Loads, Formulas for. Calculation of the Maximum Moment and the Equivalent Load on a Freely Supported Beam Under a Moving Load (Beitrag zur Berechnung des absolut grössten Momentes und des Belastungsgleichwertes für einen allgemeinen beweglichen Lastenzug), Franz Haumer. Eisenbau, vol. 11, no. 4, Feb. 27, 1920, pp. 105-111, 8 figs. Formulæ are derived based on Culmann's law and examples of their application are given.

Rectangular. The Determination of Cross-Section of Rectangular Beams Subjected to Double Bending Stress (Die Querschnittsermittlung rechteckiger auf Doppelbiegung beanspruchter Balken), H. Böhrig. Eisenbau, vol. 11, no. 12, June 15, 1920, pp. 209-210. Equations are presented and applied to concrete example.

Reinforced-Concrete. Charts for Designing T Beams, Ernest Owen. Concrete, vol. 15, no. 6, Dec. 1919, pp. 230-233, 5 figs. Developed from design formulæ.

Concrete-Beam Diagram with Top and Bottom Steel, Arthur G. Hayden. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 634-635, 2 figs. Diagram for designing or analyzing double or single reinforced-concrete beams and slabs.

Concrete Beam Tests on North Platte Project, Wyo., W. H. Fisher. Concrete Products, vol. 19, no. 1, July 1920, pp. 31-33. Tests made to determine advisability of using local gravel found on tract as a concrete aggregate for canal and lateral features. Importance of properly curing concrete is emphasized.

Control Cement Content by Field Beam Tests, Marshall G. Findley. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 703-704, 2 figs. Machine devised on New Orleans inner harbor canal, which measures breaking load of large concrete beams.

Criticism of the Ordinary Methods of Designing Reinforced Concrete Beams, James W. Pearl. Eng. & Contracting, vol. 52, no. 22, Nov. 26, 1919, pp. 616-617, 1 fig. Following proportionality is proposed for diameter for reinforced bars in preliminary designing: In straight cantilever beams, 0.010 arm; in straight simple beams, 0.005 span; in straight continuous beams at center, 0.003 span, and at support, 0.005 span.

Design of Reinforced-Concrete Beam with Double Reinforcements (Algunas consideraciones acerca del cálculo de las vigas de hormigón con doble armadura), Bartolomé Ferro. Revista del Centro Estudiantes de Ingenieria, vol. 20, no. 211, Jan. 1920, pp. 358-365, 6 figs. Method is suggested which consists in determining stress diagram and computing sections of beam with reference to diagram.

Field Beam Tests by Reclamation Service, W. H. Fisher. Concrete, vol. 16, no. 5, May 1920, pp. 236-237. Field tests of reinforced-concrete beams being made on Northport unit of North Platte project, U. S. Reclamation Service. In all cases marked increase of strength was shown by those beams covered with sand while curing as compared with beams of same age and mix that were left exposed to weather.

Field Tests of Reinforced Concrete Beams by U. S. Reclamation Service. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, pp. 714-715. Results of tests made on Northport unit of North Platte Project of U. S. Reclamation Service are said to show in all cases a marked increase of strength by those beams covered with sand while curing as compared with beams of same age and mix that were left exposed to weather, increase varying from 40 to 55 per cent.

New Formulæ for the Economical Design of Rectangular Beams Particularly as Regards Shear Resistance, John C. Gammon. Concrete & Constructional Eng., vol. 15, no. 4, April 1920, pp. 243-246. Condition for no shear reinforcement in a slab is worked out.

Rapid Computation of the Dimensions of Reinforced-Concrete Beams (Détermination rapide des dimensions a donner aux poutres en bêton armé), Henri Kampmann. Génie Civil, vol. 76, no. 21, May 22, 1920, pp. 470-472, 6 figs. Simplified approximate design formulæ.

Reinforcement for Diagonal Tension in Reinforced Concrete Beams, Edward Godfrey. Concrete, vol. 17, no. 1, July 1920, pp. 15-20, 12 figs. It is claimed that in customary designs of reinforced concrete beams, reinforcement is not placed in a position to take care of diagonal tension. A system of bending reinforcing bars diagonally in direction in which diagonal tension is said to take place is offered.

Reinforcement for Diagonal Tension, W. S. Thomson, W. A. Slater, Mr. Thompson, Sanford E. Thompson and Duff A. Abrams. Concrete, vol. 17, no. 2, Aug. 1920, pp. 43-46, 2 figs. Discussion of paper by Edward Godfrey published in July issue of Concrete. Mr. Godfrey criticized employment of vertical stirrups as diagonal tension reinforcement for concrete beams. Present writers argue in favor of such stirrups and also comment on Mr. Godfrey's suggested ideal method of reinforcing for diagonal tension.

Tests for Ascertaining Effect of Vibration upon Ferro-concrete Beams (Versuche mit Eisenbetonbalken zur Ermittlung des Einusses von Erschütterungen), Herman Schott, Otto Wawrziniok and H. Amos. Deutscher Ausschuss für Eisenbeton, no. 40, 1918, 88 pp., 123 figs. Tests made at Roy. Sax. Mechanical-Technical Testing Laboratory at Dresden during 1912-1914.

See also Timber-Concrete; CONCRETE CONSTRUCTION, REINFORCED, Vibration, Effect on Beams.

Steel. See Calculation of Size.

Stresses in. The Stressing of I-Beams by Twisting Moments (Ueber die Beanspruchung von I-Trägern durch Drehmomente), A. Senft. Zeitschrift für Bauwesen, vol. 69, nos. 10-12, 1919, pp. 683-703, 16 figs. Investigations for the approximate determination of the value of bending strength of flanges in relation to their twisting strength. Includes numerous formulæ and tables presenting polar moment of inertia of standard I-beam sections and the Differdinger Grey I-beams.

Timber-Concrete. New Experiences with Timber-Concrete (Nuove esperienze sul legno-beton), Mario Viscardini. Giornale del Genio Civile, vol. 58, Apr. 30, 1920, pp. 188-192, 3 figs. Concrete beams with timber reinforcement consisting of longitudinal tension timber strips in lower part of beam nailed together at ends and at intermediate point. Calculations are given and costs are compared with those of reinforced concrete.

Wide-Flanged. See Broad-Flanged; also STRUCTURAL STEEL, Wide-Flanged Beams.

Wooden. See Calculation of Size.

[See also GIRDERS.]

BEARING ALLOYS

See BEARING METALS; TIN, Conservation of.

BEARING METALS

Babbitt. Composition and Use of Babbitt Metals, B. H. Jarvis. Power, vol. 51, no. 16, Apr. 20, 1920, pp. 616-618, 4 figs. Discusses desirable qualities of babbitt metals, changes in manufacture that have taken place recently and probable future as applied to industries. List is given of compositions of most common alloys on market with suggestions as to their use.

Notes on Bronze and Babbitt Bearings, W. K. Frank. Proc. Engrs. Soc. Western Pa., vol. 35, no. 8, Nov. 1919, pp. 349-379 and (discussion) pp. 380-394, 16 figs. Metallurgical data and photomicrographs are presented and specifications of Am. Soc. for Testing Materials for babbitt metals are quoted and discussed. Comments are offered in connection with opinion expressed by Am. Soc. M. E. Committee on Bearing Metal that bronze is preferable to brass in bearings.

The Analysis of Babbitt Metal, H. C. Boehmer, J. R. Gordon and C. W. Simmons. Can. Chem. Jl., vol. 4, no. 6, June 1920, pp. 171-173. Metal considered is the one containing only lead, antimony and tin. Recommendations are given for analyzing metal, such as for example that reduction to stannous salt should be preferably accomplished by means of metallic antimony instead of by zinc.

Hardness Testing. See HARDNESS, Soft Metals.

Kelly. A Remarkable Bearing Metal. Gas Engine, vol. 22, no. 6, June 1920, pp. 161-162, 1 fig. Account of the Kelly bearing metal made by the Kelly Metals Co., Detroit, salient feature of which is said to be homogeneous nature of mixture, which is so amalgamated by a special process that it can be remelted and recast without altering its bearing properties. Process is said to differ radically from anything heretofore employed for this purpose. Chart is given showing results of tests by the Government.

Lead-Calcium. Calcium Bearing Metal (Kalzium-Lagermetall), H. Hart. Metall-Technik, vol. 46, nos. 19-20, May 15, 1920, pp. 73-75. Describes alloy of lead with a number of rare domestic metals, including calcium, which latter unites with a part of the lead to form hard crystals embedded in the soft lead matrix The valuable qualities and uses of the alloy are pointed out.

Substitute. Experiments with Substitute Bearing Metals at the Dockyard Laboratory of the Aviation Arsenal in Vienna (Versuche mit Ersatz-Lagermetallen bei dem Werst-Laboratorium des Fliegerarsenal in Wien), H. Praetorius. Motorwagen, vol. 23, no. 3, Jan. 31, 1920, pp. 44-46. Results of wartime experiments with aluminum, zinc and lead bearing alloys.

Substitute Bearing Metals (Ersatz-Lagermetalle), Karl Radunz. Metall-Technik, vol. 46, nos. 21-22, May 31, 1920, p. 83. Results of tests carried out in laboratory of Aircraft Arsenal in Vienna, described in Motorwagen (no. 3, Jan. 31, 1920), show that for aerial engines soft alloys can also be used, the more so because they do not weaken the crankshaft pins and improve lubrication of bearings.

Tests. Properties of White Metals with Special Reference to Those Standardized by the Chamber of Mines' Committee, G. G. Elliott. Jl. South African Instn. of Engrs., vol. 18, no. 9, Apr. 1920, pp. 152-164, 15 figs. Tests of bearing metals. Photomicrographs of various mixtures are shown and interpreted.

Tin Saving in. Conservation of Tin in Bearing Metals, Bronzes and Solders, G. K. Burgess and R. W. Woodward. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 883-885. Reference is made to experiments carried out to determine whether lowering tin content in alloys by substitution or addition of other metals would render alloys less fit for its intended use. Formulæ are suggested for modification of alloys so as to reduce their tin content.

Typical. Observations on a Typical Bearing Metal, Hilda E. Fry and W. Rosenhain. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 563-565, 14 figs. Microscopic examinations and Brinell hardness measurements of alloy composed of 4 per cent copper, 9 per cent antimony and 85 per cent tin. Paper read before Inst. of Metals. Also in Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 280-282 and 286, 14 figs.

[See also BRITANNIA METAL.]

BEARINGS

Aluminum. Aluminum Bearings (Coussinets en aluminium), M. Legrand. Industrie des Tramways et Chemins de Fer, vol. 13, nos. 148-149 and 150, Apr.-May-June 1919, pp. 30-34, 4 figs. Tests performed with cargo machine said to have given promising results. It is therefore suggested that tests be made of aluminum bearings in actual work with a view to determine advisability of substituting them for bronze bushings.

Automobile. Putting Quality First in Bearing Production, J. Edward Schipper. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 909-913, 13 figs. Methods of manufacturing bearing supporting unusually heavy and rigid crankshaft in Marmon cars.

Babbitting. See BABBITTING, Bearings.

Ball. See BEARINGS, BALL.

Design. Scientific Design in Bearings (Étude scientifique des paliers), M. Strauven. Revue Universelle des Mines, vol. 5, no. 1, April 1, 1920, pp. 53-74, 19 figs. Reference is made to Reynolds theory which establishes that when two bearing surfaces which are strictly parallel are separated by layer of oil, it is im-

possible to make them support an external load without forcing out oil film. With this theory in view forms of bearing surfaces composed of parts inclined to direction of axle are suggested.

Expanding. Expanding Bronze Bearings, C. M. Cross. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 452-453, 1 fig. Method for expanding loose armature bearings of electric motors.

Lubrication. See LUBRICATION, Bearings.

Machining. Common Errors in Machining of Bearings, Christopher H. Bierbaum. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 879-880 and 907, 6 figs. It is shown by study of photomicrographs of finished surfaces how important it is to use sharp tools with proper rake in order that crystalline structure of surface material of bearing may not be so crushed that it will fail to function as normal bearing alloy.

Protection Against Heating. Protection of Bearings, etc., Against Heating (Sicherung von Lagern usw. gegen Heisslauf mit selbsttätiger Lagerkühlung). Metal-Technik, vol. 46, nos. 3-4, Jan. 20, 1920, pp. 9-10, 1 fig. Details of construction and operation of a device for protection of bearings and other moving machine parts, whereby an alarm is sounded when a certain temperature is reached and a cooling substance is released to flow over bearing.

Roller. See BEARINGS, ROLLER.

Self-Aligning. Self-Aligning Bearings for Shafting with Belt Drives, H. D. McGuire. Belting & Transmission, vol. 16, no. 5, March 5, 1920, pp. 19-23, 16 figs. Definition and purpose of such bearings, types of ball bearings, methods of assembly, accuracy, and points to consider in determining application.

Self-Lubricating. A New Self-Lubricating Material. Textile World Jl., vol. 58, no. 11, Sept. 11, 1920, p. 41. "Cellugraph" bearings and bushings made of hard wood, usually maple, impregnated by special chemical process which is claimed to form basis of practically inexhaustible supply of lubricant.

New Bearing Material Announced after 6 Years' Tests, Charles H. Fish. Belting & Transmission, vol. 17, no. 7, Oct. 5, 1920, pp. 37-38. Description of cellugraph, a self-lubricant bushing made of hard wood impregnated by long and carefully followed chemical treatment, which is said to form basis of practically inexhaustible supply of lubricant.

Thrust. See BEARINGS, THRUST.

BEARINGS, BALL

Allowances. Ball Bearing Allowances (Kugellagerpassungen), Friedrich Weidmann. Betrieb, vol. 2, no. 13, July 1920, pp. 325-330, 4 figs. Critical discussion of the allowances heretofore employed for ball bearings and recommendations for the development of a unit system, taking into consideration the work of the German Industry Committee on Standards (NDI).

Ball Bearing Allowances (Passungen für Kugellager), H. Gohlke. Betrieb, vol. 2, no. 13, July 1920, pp. 330-331, 3 figs. States that special allowances are necessary for ball bearings and gives recommendations for the development of a system for allowances.

Ball Cages. Influence of the Ball Cage of a Radial Ball Bearing (Einfluss des Kugelkäfigs beim Kugeltraglager (Ringlager), Ed. Müller. Werkstatts Technik, vol. 13, no. 19, Oct. 1, 1919, pp. 290-293, 8 figs. Discussion of certain designs of ball cages of standard radial bearings, and investigation of influence of cage construction on permissible load for radial bearing.

Fafnir Type. Fafnir Type of Ball Bearings for Transmission Service, Harry Reynolds. Belting & Transmission, vol. 16, no. 12, June 20, 1920, pp. 33-35, 4 figs. Main feature of Fafnir box is said to be special bearing used, which is made with inner ring of extra length to insure proper squaring up of bearing with shaft and ample area of shaft support.

Heat Treatment. See STEEL, HEAT TREATMENT OF, Ball-Bearing Races.

Installation. Line Shafting and Bearings, Charles L. Hubbard. Natl. Engr., vol. 23, no. 2, Nov. 1919, pp. 565-569, 19 figs. General discussion of installation, adjustment, care, materials and sizes, alignment and lubrication, ball and roller bearings.

Journal and Roller vs. Development of Ball Bearings and Comparison of Types. Belting & Transmission, vol. 16, no. 3, Feb. 5, 1920, pp. 39-41, 7 figs. Details and results are given of tests with special apparatus on ring-oiling babbitted journal bearings, roller and ball bearings.

Load-Carrying Capacity. Load-Carrying Capacity of the Single-Row Groove-Type Ball Bearing, Arvid Palmgren. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 335-339, 9 figs. Methods of investigating, both theoretically and experimentally, carrying capacity of ball bearings, followed by SKF Co., Gothenburg, Sweden.

Lubrication. How Should We Lubricate Ball Bearings, H. R. Trotter. Can. Machy., vol. 23, no. 23, June 3, 1920, pp. 521-523, 1 fig. Various tests are described and make-up of lubricating greases for ball bearing use is given. Microphotographs of various types of greases are shown.

Manufacture. Ball-Bearing Manufacture. Machy. (Lond.), vol. 16, nos. 396 and 397, Apr. 29 and May 6, 1920, pp. 93-96, 7 figs., and 133-137, 15 figs. Description of methods used by Hoffmann Mfg. Co., Ltd., for producing balls, races and cages.

Mounting. Mounting and Care of Small Ball Bearings, Geo. R. Bott. Elec. Jl., vol. 17, no. 8, Aug. 1920, pp. 322-323. Features to be considered in selection of ball bearings. Mounting and lubrication, it is said, should be properly taken care of to insure long service.

Naval Machinery. Use of Ball Bearings in Naval Machinery (L'emploi des roulements a billes dans les constructions navales), H. Bursée. Génie Civil, vol. 76, no. 22, May 29, 1920, pp. 487-490, 13 figs. Advantages of ball bearings over other types are indicated by graphs showing for each bearing variation of coefficient of friction with load.

New Types. A New Design of Ball Bearing, L. E. Little. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 698-699, 3 figs. Special feature is patent gage which is said to give bearing advantages of both ball and roller types.

Swedish Railway Tests of Disk and Ball Bearings. Bul. Nat. Gas Engine Assn., Feb. 1920, pp. 6 and 15. Results of ball-bearing tests covering six years which are said to have led to production of entirely new type of ball bearings. Economy is claimed for disk bearings.

Presswork on. Press Work on the Bailey Ball Thrust Bearing, J. V. Hunter. Am. Mach., vol. 53, no. 10, Sept. 2, 1920, pp. 456-458, 6 figs. Describes a punch-press job on light work, giving sequence of operations on sheet-metal retainer used in a ball bearing. Examination of tools used.

Railway-Car. The Value of Ball Bearings for Railway Cars (Beitrag zur bewertung des Kugellagers in eisenbahntechnischer Hinsicht), Gustaf Rydberg. Annalen für Gewerbe u. Bauwesen, vol. 86, no. 2, Jan. 15, 1920, pp. 9-14,

8 figs. Results of numerous comparative experiments are said to show that for cars with ordinary bearings the rolling resistance is dependent on duration of time in which car is in motion, temperature of air and weight of load, and that the starting resistance is also largely dependent on outside influences. With ball-bearing cars rolling resistance is entirely independent of outside influences and is 38 per cent less than that of ordinary cars, while starting resistance is only a fraction of that of ordinary cars.

Roller vs. Comparative Characteristics of Anti-Friction Bearings, Fred A. Cornell. Jl. Soc. Automotive Engrs., vol. 5, no. 6, Dec. 1919, pp. 415-418. Best practice of American motor-driven vehicles is said to indicate that ball and taper roller have approximately same carrying capacity when length of roller is approximately equal to diameter of ball. Present standards are criticized as being based "primarily on size interchangeability," being therefore "commercial in conception and not technically tenable."

Swiveling. The Principles and Practice of Swivelling Ball Bearings, W. E. Baker. Engineering, vol. 109, nos. 2819 and 2820, Jan. 9 and 16, 1920, pp. 37-39, 10 figs., and 69-71, 17 figs. Jan. 9: Swivelling bearings, writer opines, should only be used where housings cannot be correctly aligned as in built-up machines found in textile, paper-making and other trades, and in cranes, trucks, etc. Jan. 16: It is remarked that in order that bearings run true with axis of rotation, it is necessary (1) that bearings be rigidly connected to revolving member, and (2) that revolving member run true at point on which bearings are mounted.

Three-Area Contact. Manufacturing Three-Area Contact Ball Bearings, Fred R. Daniels. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1107-1111, 10 figs., and vol. 27, no. 1, Sept. 1920, pp. 34-36, 16 figs. Also in Machy. (Lond.) vol. 16, no. 410, Aug. 5, 1920, pp. 541-545, 10 figs. Description of manufacturing, inspection and assembling methods used in shops of Federal Bearings Co., Inc., Poughkeepsie, N. Y.

[See also BEARINGS, RADIO-THRUST; STEEL, HEAT TREATMENT OF, Ball Bearings.]

BEARINGS, ENGINE

Lubrication. The Lubrication of Steam-Engine Bearings, W. F. Osborne. Power, vol. 51, no. 6, Feb. 10, 1920, pp. 215-217, 4 figs. Describes various systems from primitive "squirecan" method to modern force-feed system and splash type, and factors affecting operation of lubricants in each case are discussed and recommendations made as to proper oils to specify. Use of grease is discussed briefly.

Rebabbitting. See BABBITTING, Rebabbitting.

BEARINGS, RADIO-THRUST

Characteristics. Load Characteristics of Radio-Thrust Bearings, F. C. Goldsmith. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1190-1196, 10 figs. Charts for determining proper bearing size.

BEARINGS, ROLLER

Ball vs. See BEARINGS, BALL, Roller vs.

Disk Type. Some New Anti-friction Bearings. Motor Traction, vol. 30, no. 796, May 31, 1920, pp. 540-541, 8 figs. Disk type in which tread surface of each roller is profiled to elliptical curve so that the roller constitutes an ellipsoid with ends cut off.

Flexible. Flexible Roller Bearings, F. S. Frambach. Textile World Jl., vol. 57, no. 14, April 3, 1920, pp. 115-117, 3 figs. Comparative tests of deformation under load of Hyatt, solid and ball bearings.

Manufacture. High-Grade Bearing Steel Production Methods, E. G. Stedman. Raw Material, vol. 2, no. 1, Jan. 1920, pp. 487-489, 1 fig. Methods followed by Timken Roller Bearing Co. in manufacture of tapered roller bearings.

Tests. Tests of Large Roller Bearings Under Heavy Loads. G. M. Barnes. Am. Mach., vol. 53, no. 5, July 29, 1920, pp. 200-201, 2 figs. Tests conducted by U. S. Ordnance Department.

BEARINGS, SHAFT

Maximum Distances. Maximum Distance for Bearings on Line and Countershafts. B. D. Pinkney. Belting and Transmission, vol. 17, no. 6, Sept. 20, 1920, pp. 25-26, 1 fig. Table giving maximum distance between bearings for various sized shafts and speeds, calculated from empirical formulæ.

BEARINGS, THRUST

Ball Type. See ELEVATORS, Electric.

Hydroelectric. Vertical Hydroelectric Thrust Bearings, L. W. Wyss. Power Plant Eng., vol. 24, no. 6, Mar. 15, 1920, pp. 329-331, 7 figs. Description of four most common types, and notes on their care.

Kingsbury. Slow-Speed Tests of Kingsbury Thrust Bearings, H. A. S. Howarth. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 915-917 and 968. Operating and experimental data which show wide range of application of Kingsbury thrust bearing are presented, together with particulars of typical installations which have been in successful operation since 1911. Results of tests made on bearing having total area of 76 sq. in. on its four shoes and load of 10,000 lb. are said to have indicated that the lower the speed at which bearing is run continuously, the better are the conditions of the bearing surfaces.

Thrust Bearings for Motorships, H. A. S. Howarth. Motorship, vol. 5, no. 8, Aug. 1920, pp. 717-718, 7 figs. Details of Kingsbury design and installation arrangements.

Kingsbury vs. Horseshoe Type. Kingsbury Thrust Bearings in Marine Service, Arthur B. Lakey. Jl. Am. Soc. Mar. Draftsmen, vol. 6, no. 3, Oct. 1919, pp. 43-49, 20 figs. Comparison between marine-type horseshoe thrust bearing and Kingsbury segmental block thrust bearing.

Michell. The Michell Bearing, Eric W. Walford. Automobile Engr., vol. 9, no. 132, Nov. 1919, p. 384, 3 figs. Patented form of thrust bearing in which place where pressure is smaller than maximum is provided for continuously introducing oil.

The Theory of the Michell Thrust Bearing. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 233-236, 6 figs. Discussion of mathematical theory of device developed by G. M. Michell which, it is stated, is only really important extension to Osborne Reynold's theory of lubrication yet effected. Formulæ and equations are presented and discussed.

Radio-Thrust. See BEARINGS, RADIO-THRUST.

Self-Adjusting. A Self-Adjusting Spring Thrust Bearing. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 827-829, 5 figs. Bearing consists of runner of special grade of cast iron resting on thin steel disk with babbitted surface; babbitted ring in turn rests on short helical springs and is held against rotation by dowel pins. Built by Gen. Elec. Co.

Spring. Bearings and Lubrication for Vertical Shaft Alternators, T. W. Gordon. Gen. Elec. Rev., 23, no. 2, Feb. 1920, pp. 162-166, 9 figs.

Methods of lubricating and cooling spring thrust bearing used for large vertical shaft machines.

[See also BEARINGS, RADIO-THRUST; ELECTRIC GENERATORS, A. C., Bearings.]

BEET SUGAR

See SUGAR, Raw, Color of.

BELT DRIVE

Geometry of. Geometry of the Belt Drive (Zur Geometrie der Riementriebe), Georg Duffing. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 39, Sept. 27, 1919, pp. 951-956, 7 figs. By means of successive approximations, simple formulæ are derived from which, it is said, main details of geometric configuration of a belt drive can be ascertained, if position of pulleys and horizontal components of free belt tensions are given. A few numerical examples are worked out to demonstrate accuracy of formulæ.

BELTING

American and German Practice. Belt and Belt Tighteners (Ueber Riemen und Spannrollen), C. Bender. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 10 and 11, March 6 and 13, 1920, pp. 227-230 and 254-257, 19 figs. Discussion of belting practice in America and Germany, with particular reference to the Taylor experiments and Dr. W. Stiel's book, The Theory of Belt Drive. Writer describes and gives examples of belt drive with free-swinging tightener pulley, which he claims has many excellent points and no great disadvantages.

British vs. American Practice. Leather Belting Practice in England as Compared to Our Own. Belting & Transmission, vol. 16, no. 6, March 20, 1920, pp. 31-34, 2 figs. It is said that British prefer to run flesh side to pulley and recommend grain side only to prevent cracking in high-speed drives.

Built-up Leather. Built-up Leather Belts and Their Employment (Lederhochkantriemen und ihre Verwendung), H. Türck. Braunkohle, vol. 19, no. 14, July 17, 1920, pp. 179-182, 5 figs. Describes belts built up from narrow strips placed edgewise and riveted together. Points out their advantages, among which is their adaptability for main drives and heavily loaded drives, and the possibility of transmitting large amounts of power with relatively narrow belts.

Comparison of Types. The Prospects of Various Types of Power Transmission (Die Aussichten der verschiedenen Kraftübertragungsmittel), H. Bonte. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 36, Sept. 6, 1919, pp. 849-852, 1 fig. Discussion of advantages and disadvantages of leather and hemp belting, of rope and steel bands and suggestions for improving rope drive.

Conveyor, Rubber. Simple Tests to Assure Quality of Rubber Conveyor Belts. Belting & Transmission, vol. 16, no. 2, Jan. 20, 1920, pp. 31-32, 2 figs. Method for determining strength and elasticity of cover, strength of adhesion of cover, and strength of duck in body of belt.

Czechoslovakia, Need in. Leather Belting Seriously Needed in Czechoslovakia. Belting, vol. 15, no. 9, Nov. 5, 1919, p. 29. Doubt exists, however, whether American manufacturers would be permitted to invade field, according to trade commissioner's report.

Data on. The Management of Belting, C. Duffing. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 747-748. It is pointed out that since Taylor published his Notes on Belting, conditions in respect to material and working methods have changed to such an extent as to vitiate his conclusions, and it is therefore necessary to collect fresh material for dealing with question, partly by making experiments, and partly by studying actual running conditions in practice. Data concerning measuring tension, speed variations, etc. Translated from Der Betrieb.

Fasteners for. See Rubber.

Flexible-Wire. A Flexible-Wire Driving Belt with Soft Running Surface (Drahtgliedertreibriemen mit weicher Lauffläche), Hans Mittermayr. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 43, Oct. 25, 1919, pp. 1057-1061, 20 figs. Belt consists of flat wire spiral links wound alternately right and left and joined together by cross pins. Paper yarn is wound between spirals, and projects above them, thus giving a soft running surface and necessary adhesion for generating purposes. These belts were developed as a substitute for leather belts and tests are said to show that power output is as great as with leather belts of same width and in emergency cases even greater, but they are not practicable for all installations because they lack elasticity of leather belts. Results of tests are given.

Grinding-Machine Requirements. See GRINDING MACHINES, Belting, Requirements of.

Hair. Unusual and Severe Applications of Hair Belting. Belting, vol. 15, no. 12, Dec. 20, 1919, pp. 19-21, 6 figs. Service in bleachery, weaving mill, foundry, machine shop, power plant and sugar refinery described in detail and illustrated.

Lacings for. Comparative Advantages of Hinge and Straight Lacing. Belting & Transmission, vol. 16, no. 3, Feb. 5, 1920, pp. 33-36, 13 figs. Points out various factors that enter into application of two methods and gives details as to manner of lacing.

Leather. See British vs. American Practice; Built-up Leather; Czechoslovakia; Specifications.

Leather, Joining. Practical Methods Used for Joining Leather Belts. Belting, vol. 15, no. 12, Dec. 20, 1919, pp. 41-47, 17 figs. Illustrates methods of making glue splice, lace belts and applying fasteners.

Leather, Substitutes for. Substitutes for Leather Belting. Nat. Engr., vol. 24, no. 3, Mar. 1920, pp. 101-106, 6 figs. Results of tensile breaking tests on belts of leather link type manufactured from individual links of wire, wood, compressed paper or sheet metal. From Eng. & Indus. Management, Lond.

The Question of Substitutes for Leather Belting, G. Steinmetz. Eng. & Indus. Management, vol. 2, no. 20, Nov. 13, 1919, pp. 611-613, 6 figs. Substitutes are divided into two classes, (1) manufactured on principle of textile belting from woven flat webbing, strapping or rope of hemp, paper, etc., with or without interwoven wire, and (2) of leather link type manufactured from individual links of wire, wood, compressed paper or sheet metal. Results are given of textile breaking tests. Translated from Der Betrieb.

Power Transmission by. Experiments on the Transmission of Power by Belting, W. M. Sawdon. Belting, vol. 15, no. 11, Dec. 5, 1919, pp. 23-29. Work of Morin, Towne, Briggs, Sawyer, Nagle, Holman, Bird, Lewis, Taylor and Barth, and tests made at Cornell University since 1910.

Rubber. Development and Modern Application of Rubber Belting, J. W. Ferguson. Belting, vol. 15, no. 11, Dec. 5, 1919, pp. 29-32. Factors to be considered to insure satisfactory service.

Easy Method to Determine Proper Thickness of Rubber Belt. Belting & Transmission, vol. 16, no. 6, March 20, 1920, pp. 23-26, 3 figs. Chart is given for calculating thickness of rubber belt in order to transmit required horse-

power, and also table for finding horsepower.

Tests of Fasteners and Splices for Rubber Belting. Belting, vol. 15, no. 11, Dec. 5, 1919, pp. 43-47, 13 figs. Importance of joint as strong as belt itself is emphasized, and value of vulcanization, even when crudely performed, pointed out.

See also RUBBER, Mechanical Goods.

Specifications. Notes on Operation and Care of Leather Belting, H. T. Clawson. Belting and Transmission, vol. 17, no. 4, Aug. 20, 1920, pp. 31-34, 5 figs. Navy Department specifications. Rules for calculation.

See also Rubber.

Steel. An Experimental Investigation of Steel Belting, F. G. Hampton, C. F. Leh, and W. E. Helmick. Mech. Eng., vol. 42, no. 7, July 1920, pp. 369-378, 13 figs. Particulars regarding belt material and joints used. Description of apparatus employed in tests. Determination of relationships existing between horsepower transmitted, velocity of slip on pulleys, and coefficient of friction.

Tension Rollers. Tension Rollers for Driving Belt, C. Bender. Eng. & Indus. Management, vol. 34, no. 19, May 12, 1920, p. 560. Essential feature in use of tension rollers or pulleys in belt driving is said to be that they should be placed close up against smaller belt pulley, and mounted so as to swing freely against slack side of belt and force latter to embrace largest possible arc on pulley. Details and illustrations of several arrangements. (Translated from Zeitschrift des Vereines deutscher Ingenieure.)

Tighteners. See American and German Practice, Tension Rollers.

Uruguay Industry. Belting Industry in Uruguay Wins Control of Field. Belting, vol. 15, no. 9, Nov. 5, 1919, pp. 33-34. Balata only type that is not produced there and alone offers itself for exploitation by manufacturers in the United States.

BELTS

See BELTING.

BENDING

Axial Compression. Bending Produced by Axial Compression (Knickungsbiegung), A. Koenig. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 10, no. 21, Nov. 15, 1919, pp. 233-234, 2 figs. Writer develops a new equation based on Clapeyron moment equations of Müller-Breslau.

BENZENE

Chlorination of. Kinetical Study of Chlorination of Benzene (Étude cinétique de la chloruration du benzene), F. Bourion. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 22, May 31, 1920, pp. 1319-1321. Experimental investigation of conditions increasing efficiency of process of forming monochlorobenzene by action of chlorine on benzene with iron as catalyzer.

High-Temperature Reactions with Toluene. Some High-Temperature Reactions of Benzene and Toluene, S. F. Dufton and John W. Cobb. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 485-488. Also in Gas Jl., vol. 150, no. 2978, June 8, 1920, pp. 588-591, 1 fig. Experimental. Benzene passed through heated column of coke with time of contact of about 12 sec. began to undergo molecular condensation in an inert gas at about 500 deg. cent. with elimination of hydrogen, first product being diphenyl. At 750 deg. cent. action was much more extensive and more complex. At 920 deg. cent. free carbon was produced in quantity.

BENZOL

Aircraft Fuel. See AEROPLANE ENGINES, Fuels.

Bregiat Recovery Process. Benzol Recovery in France. Gas Jl., vol. 149, nos. 2962 and 2963, Feb. 17 and 24, 1920, pp. 364-365, 2 figs., and 432-433, 1 fig. Describes policy and method, with particular reference to Bregiat process, a recovery process said to be based chiefly on use of a special absorbent consisting of suitable mixtures of phenol compounds from distillation of coal tar.

Coal Gas as Source. Removal of Benzol from Coal Gas (Le débenzolage du gaz), A. Grebel. Génie Civil, vol. 75, no. 19, Nov. 8, 1919, pp. 445-452, 10 figs. Processes developed during war.

Impurities. Impurities of Benzol Extracted from Industrial Chlorobenzines (Impuretés de benzene extrait des chlorobenzenes industriels), M. F. Bourion. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 20, May 17, 1920, pp. 1181-1184. Chloroform, normal hexane, normal heptane and other substances are claimed to have been detected by fractional distillation.

Marketing. British Plans for Marketing Benzol. Gas Age, vol. 45, no. 1, Jan. 10, 1920, pp. 28-32, 3 figs. Organization and work of society formed in England to advertise and introduce benzol as motor-car fuel.

Poisoning by. Cases of Chronic Benzol Poisoning in the Rubber Industry. India-Rubber Jl., vol. 58, no. 15, Oct. 11, 1919, pp. 1-2. From annual report for 1918 of chief inspector of factories and work shops.

Refining Plant. A Benzole Refining Plant. Gas Jl., vol. 151, no. 2991, Sept. 8, 1920, pp. 508-509. Details of construction and operation.

New Benzol Refining Plant. Iron & Coal Trades Rev., vol. 101, no. 2740, Sept. 3, 1920, pp. 294-295, 2 figs. Plant recently installed at Cadishead works of British Tar Products, Ltd.

Vapor-Air Mixtures, Combustion of. The Scientific and Practical Basic Conditions for the Formation and Combustion of Benzol Vapor-Air Mixtures (Die wissenschaftlichen und praktischen Grundbedingungen für die Entstehung und Verbrennung von Benzoldampfluftgemischen), Bruno Müller. Elektrotechnische Rundschau, vol. 36, nos. 31-32, Aug. 6, 1919, pp. 113-114, 2 figs. It is maintained that the two most important criteria for determining danger of explosion are (1) explosion range of mixture of air and vapor of element in question and (2) its evaporating qualities.

BIBLIOGRAPHIES

A. C. Measurements. See ELECTRIC CURRENTS, ALTERNATING, Bridge Measurement.

Barite. See BARITE, Occurrences.

Coal Storage. See COAL STORAGE, Safe Methods.

Dyes. See DYES, Bibliography.

Employment Management. See EMPLOYMENT MANAGEMENT, Bibliography on.

Heat Transmission. See HEAT TRANSMISSION, Bibliography.

Industrial Management. See INDUSTRIAL MANAGEMENT, Bibliography.

Labor. See LABOR, Bibliography.

Nitrogen Industry. See NITROGEN INDUSTRY, Development of; World Resources.

Paper Manufacture. See PAPER MANUFACTURE, Research Literature.

Paving Materials. See ROADS, Motor-Vehicle Traffic, Requirements for.

Petroleum. See PETROLEUM, Bibliography.

Platinum. See PLATINUM, Bibliography.

Rubber. See RUBBER, Bibliography.

Steel and Iron. See STEEL, Literature for 1919.

Surface Combustion. See COMBUSTION, Surface.

Tin. See TIN, Bibliography.

BINS

Calculations for. Computation of Bending Moment and Determination of Wall Cross-Sections of Bins by Means of the Thrust-Bending Moment Ratio (Berechnung der Biegungsmomente und Bemessung der Wandquerschnitte der Silozelle mit Hilfe des Einspannungsgrades), H. Palen. Beton u. Eisen, vol. 18, no. 16, Oct. 3, 1919, pp. 175-178, 2 figs. Notes taken from work with above title, published by Robert Noske, Borna-Leipzig.

Grain. See GRAIN BINS.

[See also SILOS.]

BIOTITE

Infra-Red Radiations. The Transparency of Biotite to Infra-red Radiations, L. C. Martin. Proc. Royal Soc., vol. 96, no. A-676, Oct. 9, 1919, pp. 185-200, 8 figs. Experimental verification of results found by Sir Wm. Crookes. Transmission effect is attributed to temporary chemical change due to rise of temperature.

BISMUTH

Electronic Constants. Determination of the Electronic Constants of Bismuth (Determinazione delle costanti elettroniche del bismuto), G. C. Trabacchi. Elettricista, vol. 8, no. 14, July 15, 1919, pp. 105-106. Equations for average speed of positive and negative ions.

Thin Films. Physical Properties of Thin Metallic Films. Magneto-Resistance Effects in Thin Films of Bismuth. Part I: J. A. Becker and L. F. Curtiss; Part II: F. K. Richtmyer and L. F. Curtiss. Physical Rev., vol. 15, no. 6, June 1920, pp. 457-464 and 465-475, 8 figs. Part I gives a historical summary and an experimental investigation of magneto-resistance effects in films of bismuth. Part II gives a discussion of the increase of resistance of bismuth films in a magnetic field; the effect of heat treatment; and the negative temperature coefficient.

BITUMENS

Manjak. See MANJAK.

BITUMINOUS COAL

See COAL, Bituminous.

BITUMINOUS MATERIALS

Distillation of. Gasification and Distillation of Bituminous Materials (Vergasung und Entgasung bituminöser Stoffe), H. Bube. Braunkohle, vol. 19, no. 16, July 31, 1920, pp. 201-206. A method is described for the complete or partial gasification or distillation of bituminous materials, with regulated, graduated heating, under avoidance of superheating.

BLACK BODY

Luminosity of. Photometric Luminosity of Black Bodies and Metallic Radiations (Die photometrische Helligkeit des schwarzen Körpers und der metallischen Strahler), F. Henning, Jahrbuch der Radioaktivität und Elektronik, vol. 16, no. 1, 1919, pp. 1-18, 2 figs. Luminosity as a function of temperature and specific radiation qualities. Photometric luminosity of brilliant metals.

BLACKSMITH SHOPS

See FORGING, Forge Shops.

BLAST-FURNACE GAS

Analysis. Blast-Furnace Gas Analysis and the Phenomena in Blast Furnaces (Gichtgasanalyse und die Vorgänge im Hochofen), H. Jüptner. Berg- u. Hüttenmännisches Jahrbuch, vol. 68, no. 1, 1920, pp. 1-48, 3 figs. Writer seeks to draw conclusions regarding these phenomena from the composition of blast-furnace gas, basing his calculations on the volume-percentage composition rather than on the weights of the constituents of gas, as heretofore commonly done.

Burners. New Burner for Blast Furnace Gas, Donald N. Watkins. Blast Furnace and Steel Plant, vol. 8, no. 9, Sept. 1920, pp. 499-505, 14 figs. Steinbart burner as used in blast furnaces at Lorain Works of National Tube Co. Automatically regulates air for burner.

Cleaning. Blast Furnace Plants Install Electrical Precipitation for Cleaning Gas, N. H. Gellert. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 32-35, 5 figs. Points out economies in furnace operation effected by gas cleaning, and enumerates objections to wet cleaning and advantages of electrical precipitation.

Cleaning Blast-Furnace Gases. Elec. Rev. (Lond.), vol. 87, no. 2202, Feb. 6, 1920, pp. 164-166, 10 figs. Description of Halberg-Beth dry gas-cleaning system.

Cleaning Blast Furnace Gas by Electrical Precipitation. Am. Gas. Eng. Jl., vol. 112, no. 3, Jan. 17, 1920, pp. 45-48 and 52-53. Results of actual measurement are said to have shown that electrical precipitation can clean gas to less than one-tenth grain of dust per cubic foot of gas at standard conditions.

Electrical Cleaning of Gases as Applied to Blast Furnaces, N. H. Gellert and K. V. Laird. Jl. Engrs. Club Philadelphia, vol. 36, no. 181, Dec. 1919, pp. 449-463, 10 figs. Type of blast furnace gas cleaner used by Am. Manganese Mfg. Co., Dunbar, Pa. Cleaner is said to have been designed with view to adopting Cottrell electrical precipitation process to blast furnace.

New Multi-Centrifugal Gas Cleaner, A. R. Schulze. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 553 and 574, 1 fig. New development used at Mingo and Bellaire works of Carnegie Steel Co. which does away with losses caused by wet washing blast-furnace gas.

Rough-Cleaning of Blast-Furnace Gas at Skinningrove by the Lodge Electrostatic Process, A. Hutchinson and E. Bury. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 9, 18 pp., 4 figs. It is said that with 80 to 85 per cent of electrostatic plant at work, remainder awaiting electrical equipment dust in gas has been reduced from 5 to 6 gr. per cu. m. in dirty gas to 0.8 to 1.1 gr. in cleaned gas, and that above results have been attained with total fuel consumption corresponding with 50 kw. only. It is added that no power is necessary for pumping water or for moving gas through system and recovery is effected of 48 to 50 tons per week containing 27 per cent KCl.

The Cleaning of Blast-Furnace Gases. Iron & Coal Trades Rev., vol. 99, no. 2703, Dec. 19, 1919, pp. 799-800, 11 figs. partly on two suppl. plates. Halberg-Beth dry plant for cleaning gas by separating dust without requiring water.

Electric-Furnace. Calorific Power of Electric Blast Furnace Gases (Il valore calorifico dei gas di alto forno elettrico rispetto a quelli di alto forno a coke), Marcello Guédras. Forno Elettrico, vol. 2, no. 2, Feb. 15, 1920, pp. 33-35. Gas in electric furnace has calorific value

of 2257 calories per kilogram, whereas in ordinary furnace it has only 638 calories per kilogram. Difference is due to high percentage of carbon monoxide in electric furnace gases.

Flue Dust in, Reduction of. Blast-Furnace Flue Dust, R. W. H. Atcherson. Min. & Metallurgy, no. 158, section 30, Feb. 1920, 12 pp., 3 figs. Experience at Ohio works of Carnegie Steel Co. in recharging raw flue dust to furnace and with various methods of reducing flue dust from furnace gas.

Halberg-Beth Process. See Cleaning.

Potash from. See POTASH.

Power from. The Production of Power from Blast Furnace Gas, S. F. Fowles. Eng., vol. 109, no. 2831, Apr. 2, 1920, pp. 443-445, 3 figs. Diagram of Halberger-Beth gas cleaning plant. With waste crude gas from three furnaces, hot stoves are kept fully supplied with clean gas and consume about 1,000,000 cu. ft. per h., and boilers are fully supplied with clean gas and consume about 0.6 million cu. ft. of clean gas per hour. Paper read before Instn. Elec. Engrs.

Utilizing Blast Furnace Gas for Power, F. H. Willcox. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 337-340. Experience of one plant.

Purification of. Electric Precipitation of Solid and Liquid Particles from Gases (Elektrische Ausscheidung von festen und flüssigen Teilchen aus Gasen), R. Durrer. Stahl und Eisen, vol. 39, no. 50, Dec. 11, 1919, pp. 1546-1554, 8 figs. Writer states that Americans, in pointing out advantages of process, seem to avoid as much as possible any mention of disadvantages: for example, he calls attention to fact that there seems to be scarcely any reference in American technical literature to closing up of such plants, although writer claims to have verbal information that a number have been closed. His personal belief is that in a few years electric gas purification processes will be so developed that no other method will be employed in new plants for purification of blast-furnace gases.

Use as Fertilizer. Blast Furnace Gas as Agricultural Fertilizer (Emploi des gas de hauts fourneaux pour la fertilisation carbonique en agriculture), F. Riedel. Chaleur & Industrie, no. 3, May 1920, pp. 178-181, 2 figs. Blast-furnace gas enriches air with carbonic acid and this favors growth of plants. Experiments showed that such fertilization gives results 2 to 2.3 times better than under ordinary conditions. Translated from Stahl und Eisen.

Use under Boilers. Blast Furnace Gas Used Under Boilers, F. J. Denk. Blast Furnace and Steel Plant, vol. 8, no. 9, Sept. 1920, pp. 524-526, 3 figs. Progress made in getting greater efficiency out of blast-furnace gas when used under boilers.

Utilization of Waste Heat in. Power Production from Blast-Furnace Gas. Iron & Coal Trades Rev., vol. 100, no. 2715, March 12, 1920, p. 345. Tabulated comparison of working results obtained in old and new methods of utilization of waste heat in blast-furnace gas. Paper read before Cleveland Institution of Engineers.

Volumetric Data. Volumetric Data of Blast-Furnace Gas for Determining Utilization of Coal (Emploi direct des analyses en volumes des gaz du haut fourneau pour divers calculs sur l'utilisation du carbone), J. Seigle. Bulletin et Comptes rendus mensuels de la Société de l'Industrie Minérale, vol. 17, no. 5, Jan.-Feb. 1920, pp. 5-18. Calculation of calories produced by combustion of coal from volumetric data of blast-furnace gas.

[See also BOILER FIRING, Blast-Furnace Gas Fuel.]

BLAST FURNACES

Air Preheating in. Thermal, Constructional and Operating Conditions Necessary to Insure Efficient Preheating of Air in Blast Furnaces (Die thermischen, baulichen und betrieblichen Bedingungen für einen günstigen Wirkungsgrad der Winderhitzung bei Hochöfen), Hugo Bansen. Stahl und Eisen, vol. 39, no. 47, Nov. 20, 1919, pp. 1417-1423, 7 figs. Weight of structure, heat contents, time required for warming up air preheater and amount of gas required for heating are discussed.

Thermal, Constructional and Operating Conditions and Their Relation to Efficient Preheating of Air in Furnaces (Die thermischen, baulichen und betrieblichen Bedingungen für einen günstigen Wirkungsgrad der Winderhitzung bei Hochöfen), Hugo Bansen. Stahl und Eisen, vol. 39, no. 20, May 15, 1919, pp. 531-538, 8 figs. Calculating dimensions of preheater from amount of flue gas and its velocity. Means for increasing efficiency.

Blowers. See STEEL WORKS, Blowers.

British Practice. British Blast-Furnace Practice, Fred. Clements. Iron & Steel Inst., Paper 3, Annual Meeting, May 6 & 7, 1920, 24 pp., 6 figs. Also in Engineering, vol. 109, no. 2837, May 14, 1920, pp. 646-650, 8 figs., and Colliery Guardian, vol. 119, no. 3098, May 14, 1920, pp. 1355-1356, 3 figs. Deals especially with records of blast furnace plant of Park Gate Iron & Steel Co., Ltd., consisting of three furnaces on modern lines equipped with mechanical distribution, Cowper stoves and gas-driven blowing engines. Chemical and thermal balance sheets are shown. In conclusion author offers his idea of furnace capable of average output of 250 tons of pig iron per 24 hr. from burden giving pig-iron yield of 30 per cent.

Modern Practice in the Construction and Equipment of British Blast-Furnace Plants, W. H. Buckley. Iron & Gas Trades Rev., vol. 100, no. 2714, March 5, 1920, pp. 323-325, 1 fig. It is reported that reciprocating steam blowing engines are fast being replaced by either turbo-blowers or gas-driven blowing engines and that Halberg-Beth system of gas cleaning has proven itself efficient. It is expected that future plants will not exist as isolated units but will be operated in conjunction with and in close proximity to coke ovens and steel works.

Chemical and Thermal Reactions in. The Chemical and Thermal Conditions in Blast-Furnace Practice, H. E. Wright. Iron & Steel Inst., Paper 11, Annual Meeting May 6 & 7, 1920, 21 pp., 1 fig. Based on work of Sir Lowthian Bell.

Coke for. See COKE, Moisture Content of.

Copper. See COPPER METALLURGY, Blast-Furnace Charging.

Design. Design of Shaft Base and Framework for Blast Furnaces (Bauart der Schachtträger und des Gerüstes für Hochöfen), B. Cellar. Stahl u. Eisen, vol. 40, no. 29, July 22, 1920, pp. 965-969, 6 figs. Details of older and newer types, and description of a new construction of shaft base by use of which from tapping platform a free view and undisturbed operation can be obtained as well as easy access to all parts of boshes and furnace shaft. Gives load assumptions and steel stresses in general use for blast-furnace frameworks.

New American Blast Furnace Plant. Iron & Coal Trades Rev., vol. 99, no. 2696, Oct. 31, 1919, pp. 559-561, 7 figs. At steel works in West Virginia. Attention is called prin-

cipally to design features intended to bring about economy in coke and in labor, and utilizing excess furnace gas.

Development in 1919. Blast Furnace Development During 1919, Harvey W. Linhardt. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 26-27. Notes how abnormal economic conditions influence blast-furnace operation.

Failure of Stock-Line Brick. Failure of Blast Furnace Stock Line Brick, L. P. Ross. Iron Age, vol. 105, no. 2, Jan. 8, 1920, pp. 117-118. Failure is attributed to carbon deposition caused by use of war scrap in charge.

Flue-Dust Briquetting. The Development of Flue Dust Briquetting, Albert L. Stillman. Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 395-398, 3 figs. Process is believed to offer efficient treatment, simple mechanism and low cost for recovery of iron from flue dust.

Ford Automobile Plant. From Ore to Finished Auto in Ford's River Rouge Plant, F. L. Prestiss. Automotive Manufacturer, vol. 62, no. 4, July 1920, pp. 10-16, 6 figs. Blast furnace and iron ore pile incorporated in automobile plant so that molten iron from cupola can be poured directly into mold of foundry without reheating.

Gas, Volume from. Notes on Steelworks Layout, M. Corliss. Mech. World, vol. 67, no. 1743, May 28, 1920, pp. 341-342. Rough estimation of volume of gas given off by a blast furnace, and of heat value of gas is given.

Heat Supply. Variations in the Heat Supplied to the Blast-Furnace, and Their Effect on the Fuel Consumption, W. W. Hollings. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 6, 12 pp. It is concluded from analytical premises set forth in paper that for countries with such low average absolute moisture as England it does not pay to install dry-blast, and that crushing of materials of charge to uniform size may be expected to result in considerable economy of fuel required per ton of pig iron.

India. American Engineers Design New Blast Furnace Plant for Far East. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 28-30, 2 figs. Concerning erection of 350-ton capacity blast furnace together with 168 oven by-product coke plant at Calcutta, India.

Builds Blast Furnace Plant in India. Iron Trade Rev., vol. 65, no. 26, Dec. 25, 1919, pp. 1717-1719, 2 figs. Attention is called to provisions of design which permit future additions.

New Jersey. New Blast Furnaces of Replogle Steel Co. Iron Age, vol. 106, no. 15, Oct. 7, 1920, pp. 895-901, 11 figs. Two furnaces recently added are 90 ft. high with diameter of 21 ft. 6 in. at bosh, 17 ft. 6 in. in crucible and 16 ft. 10 in. at stock line. They are rated at 500 tons per day each.

Oxygen Enrichment of Air. Oxygen Enrichment of Air in Metallurgy, F. G. Cottrell. Iron Age, vol. 105, no. 26, June 24, 1920, pp. 1791-1793. Application to blast furnace. Possibilities in open-hearth furnace, the converter and in gas producers. Paper read before Am. Iron & Steel Inst.

Oxygen from Ore. A Method of Calculating the Oxygen Directly or Indirectly Obtained from the Ore in Blast Furnaces (Verfahren zur Berechnung des direkt oder indirekt vergasten Erzsauerstoffes im Hochofen), Hermann Thaler. Stahl u. Eisen, vol. 40, no. 10, Mar. 4, 1920, pp. 318-321. Formulæ are derived with which writer claims it is possible to determine empirically the absolute reduction work of a blast furnace, the necessary data for the calculation being obtained from the material balance of any blast furnace.

Performance. Charts for Computing Blast-Furnace Performance, Harold L. Fickett. Eng. and Min. Jl., vol. 110, no. 3, July 17, 1920, pp. 108-109, 2 figs. Graphical determination of slag production, matte fall, and tonnage smelted per sq. ft. Methods used at Copper Queen Smelter.

Pulverized Coal for. See PULVERIZED COAL, Blast Furnaces, Use in.

Rapid Construction. Blast Furnace Plant Built in One Year. Iron Age, vol. 105, no. 7, Feb. 12, 1920, pp. 461-467, 12 figs. Account of construction of plant for Weirton Stack Co., Weirton, W. Va.

Reactions in. Contributions to the Study of the Reactions in Connection with Blast-Furnace Equilibrium (Beiträge zur Kenntnis der Reaktionen beim Hochofengleichgewicht), Ernst Terres and Aurel Pongracz. Zeitschrift für Elektrochemie, vol. 25, no. 23-24, Dec. 1, 1919, pp. 386-407, 13 figs. Supplement to investigations for determination of different equilibria of the reactions between iron or its oxides and CO_2, CO, steam and hydrogen, and investigation of changes in solid and gas phases for purpose of clearing up differences between present and previous work.

Remodeling. Remodeled Blast Furnace. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1064-1065, 1 fig. How capacity of blast furnace was increased two-thirds.

Remodeling Furnace Plants for Economy, F. H. Willcox. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 35-36. Notes on how blast furnace plants have been re-designed and rebuilt for more economical fuel consumption and reduction of operating cost.

Safety in Operation. Reducing Blast Furnace Hazards, L. A. Touzalin. Iron Trade Rev., vol. 67, no. 15, Oct. 7, 1920, pp. 987-989. It is held that safety thinking, coupled with employment of improved safety devices, lessens danger lurking in blast furnace gases, hot metal and cinder, and mechanical apparatus. Drills and instruction important.

Safe Practices in Blast Furnace Operations, L. A. Touzalin. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 971-972. Gas most serious hazard. Need of care in use of helmets. Hot-metal and cinder burns. Skip hoist cause of accidents. From address delivered before Nat. Safety Council.

Slag. See SLAG.

Smelting Costs and Values. Calculation of Unit Smelting Costs and Values, C. A. Grabill. Eng. and Min. Jl., vol. 110, no. 13, Sept. 25, 1920, pp. 615-620. Calculation of blast-furnace charges and costs, fixed vs. operating expenses and their effect.

Turbo-Blower for. The Turbo-Blower Installation at the Blast Furnaces of the British-America Nickel Corporation, Sudbury, Ont. Can. Min. Jl., vol. 41, no. 22, June 4, 1920, pp. 459-460, 5 figs. Description and illustration of turbo-installation built in its entirety by Dominion Bridge Co. at Lachine, Que., to deliver air for blast of furnaces in which nickel ore mined by British-America Nickel Co. at Sudbury is reduced to a matter for further treatment at the refinery at Deschênes, Ottawa.

[See also COPPER METALLURGY, Smelting with Bituminous Coal.]

BLASTING

Accident in. A Fatal Blasting Accident, Oliver Bowles and J. E. Crawshaw. Cement, Mill & Quarry, vol. 16, no. 12, June 20, 1920, pp.

13-14, 1 fig. Conclusions drawn from accident in Pennsylvania quarry are enumerated.

Compressed-Air. Blasting Granite with Compressed Air, Oliver Bowles. Reports of Investigations, Bur. of Mines, serial no. 2154, Aug. 1920, 3 pp. Application as substitute for explosives for breaking rock in granite quarries in Lithonia, Ga.

Detonating Fuse. See QUARRYING, Cement Rock.

Liquid Air for. See EXPLOSIVES, Liquid Air; LIQUID AIR, Explosive Properties.

Quarry. See QUARRYING, Well-Drill Blasting.

[See also EXPLOSIVES.]

BLIND

Employment. Blind Workers Prove Efficient, Eva B. Palmer. Can. Machy., vol. 24, no. 14, Sept. 30, 1920, pp. 297-299, 4 figs. It is said that 69 operations are successfully accomplished by blind workers employed at Cleveland shops.

Cleveland Shops Open to Blind Workers, Eva B. Palmer. Iron Age, vol. 106, no. 10, Sept. 2, 1920, pp. 569-572, 4 figs. Sixty-nine manufacturing operations now performed in that city by sightless, principally in metal-working industries. Workers prove efficient.

Employing the Blind. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 778-779. Records showing that blind men can be successfully employed in machining operations.

Reading by Sound. See OPTOPHONE.

Vocational Training. See VOCATIONAL TRAINING, Blind Soldiers.

BLOWERS

Cupola. See CUPOLAS, Blowers.

Electric Drive for. The Electric Drive of Steel Works Blowers (Der elektrische Antrieb von Stahlwerksgebläsen), M. Gaze. Stahl u. Eisen, vol. 40, no. 23, June 10, 1920, pp. 783-786, 2 figs. Describes an electrically driven piston blower and points out improvements which can be attained therewith.

Steel-Works. See STEEL WORKS, Blowers.

Turbo. High-Speed Turbine-Driven Blowers, C. H. Smoot. Power, vol. 51, no. 12, Mar. 23, 1920, pp. 450-451, 6 figs. Describes type of high-speed turbine and blower developed by the Rateau Battu Smoot Co., New York City, most significant feature in turbine being use of a single steel forging for entire rotating element. Stationary part of turbo-blower is entirely water-jacketed by use of large water spaces which may be readily inspected and cleaned of sediment.

Single-Stage Turbo-Blower Operating Normally at 22,000 R.P.M. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 327-328, 4 figs. Capable of compressing in single stage 4000 cu. ft. of free air per min. to 21 lb. per sq. in. with rotor running at top speed of 1400 ft. per sec. Turbine develops normally 300 hp. and weighs 6.7 lb. per horsepower.

Vibration in. An Unusual Condition of Vibration in Blast Pipes and Blowers, James N. Downey. Am. Gas Assn. Monthly, vol. 1, nos. 11-12, Nov.-Dec. 1919, pp. 650-655. Experiments with blowers of 175 cu. ft. capacity at 3 lb. pressure and 135 r.p.m. Blower was subjected to two tests, one with varying speed and one with varying pressure.

BLUEPRINTING

Electric. Progress in Electric Blueprinting (Neue Fortschritte in der elektrischen Lichtpauserei), A. Koch. Elektrotechnischer Anzeiger, vol. 36, no. 88, Aug. 21, 1919, pp. 410-411, 5 figs. Construction and manipulation of various types of apparatus which utilize waste heat from arc lamps for drying purposes.

BOILER EXPLOSIONS

Causes. Boiler Explosions Reports. Mar. Eng. & Naval Architect, vol. 42, nos. 507 and 508, Dec. 1919 and Jan. 1920, pp. 131-133 and 166-168, 7 figs. Explosion was believed to have been caused by spigot portion of manhole door fitting loosely in manhole thus rendering no support to insufficiently tightened jointing material.

Gas Explosion in Flues. Steam Boiler Explosion in the Augustiner Brewery in Münich (Dampfkesselzerknall in der Augustinerbrauerei zu München), K. Graf. Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, no. 6, Mar. 31, 1920, pp. 41-44, 6 figs. It is demonstrated that accident was due to a gas explosion in the flues of the boiler, and the mud collector probably exploded before it broke loose from boiler. Gives conditions prescribed for the reinstallation of boiler.

BOILER FEEDWATER

Gas Removal from. The Removal of Gases from Boiler Feedwater (Ueber die Entgasung des Kesselspeisewassers), Ludwig Jung. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 8, Feb. 21, 1920, pp. 186-189, 10 figs. Also in Stahl u. Eisen, vol. 40, no. 10, Mar. 4, 1920, pp. 321-326, 10 figs., and Eng. & Indus. Management, vol. 3, no. 13, Mar. 25, 1920, pp. 393-396, 3 figs. Harmful effect of dissolved gases in feedwater on boiler plate is shown by means of photomicrographs, importance of using gas-free feedwater is pointed out and equipment for obtaining it is described.

The Separation of Dissolved Gases from Water, J. R. McDermet. Mech. Eng., vol. 42, no. 5, May 1920, pp. 237-278, 6 figs. Process is outlined which consists of rapid injection of heated water into region of vacuum, and explosive boiling of it at expense of heat of liquid, with simultaneous recovery of heat liberated to vacuum by heat exchanger or condenser cooled by incoming water, preliminary to its heating.

Heating. Feed Heating for Land Power Stations—II and III, K. Baumann. Engr., vol. 130, nos. 3372 and 3373, Aug. 13 and 20, 1920, pp. 150-152 and 127-130, 5 figs. Fundamental principles governing economy of power stations. Comparison of heat consumption of prime mover with various methods of heating feedwater by steam.

See also FEEDWATER HEATERS, Types.

Improved Quality on Board Ship. Better Boiler Water, C. A. Bonvillian. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 488-502, 1 fig. on supp. plate. Methods available for improvement of quality of boiler water on board ship.

Injectors. See INJECTORS, Boiler Feedwater.

Regulator for. McDonough Single-Tube Feed Water Regulator. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, p. 813, 2 figs. Yoke of valve is of swivel construction so that it can be turned in any position and locked to bonnet by setscrew.

Softening. Boiler Water Treatment. Universal Engr., vol. 31, no. 6, June 1920, pp. 39-40. Notes on nature and origin of scale formers in boiler water; means of removing scale formers from water; objections to use of boiler compounds; water softening by other chemical means; advantages and disadvantages of zeolite process, etc.

Lime-Barium Softener for Treatment of Boiler Feed Water, C. A. Mehring. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and

19, 1919, pp. 629-632, 2 figs. Operating procedure, specially methods of charging softeners and washing filters, sampling and analyzing, and gaging flow with weir.

The Hot Process Boiler Feed Water Softener. Power House, vol. 13, no. 11, June 5, 1920, pp. 245-249, 7 figs. Short treatise on effect of heat on chemical reactions, and account of some experiments carried out by Harrison Safety Boiler Works.

Treatment. Boiler Feedwater Purification with Soda Substitutes (Ueber Kesselspeisewasserreinigung mit Sodaersatzmitteln), Carl Braungard. Chemiker-Zeitung, vol. 44, no. 53, May 1, 1920, pp. 334-335. Writer refers to the numerous ineffective means of purification which have been introduced because of scarcity of soda, and maintains there are enough chemicals which can be used effectively in place of soda providing automatic dosing is employed in the water purification plant.

Progress in the Purification of Boiler Feedwaters (Fortschritte in der Reinigung von Kesselspeisewassern), D. B. Preu. Zeitschrift für angewandte Chemie, vol. 33, nos. 22 and 24-25, Mar. 16 and 26, 1920, pp. 61-63 and 70-72, 1 fig. Discusses various purification methods and apparatus and points out their defects, many of which, it is claimed, are eliminated by application of the Neckar water-purification process with use of apparatus constructed by P. Müller Co., Ltd., Stuttgart, consisting of a purification tank with built-in drop pipe, filter and sludge collector with sludge-discharging device, which is connected with a second tank for refiltration provided with similar equipment.

Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 52, no. 7, Aug. 17, 1920, pp. 254-256, 4 figs. Installations for treating boiler feed water at rolling mills in Youngstown district.

See also WATER SOFTENING.

BOILER FIRING

Blast-Furnace Gas Fuel. Heating Steam Boilers with Blast-Furnace Gas (Etude du chauffage des chaudiéres à vapeur par le gaz de hauts fourneaux), A. Lombard. Chaleur et Industrie, no. 2, Apr. 1920, pp. 93-96, 2 figs. Technical study. It is computed that heating surface of boiler should be 1.45 times that required for a boiler heated with coal and producing the same amount of steam per hour.

Coal vs. Oil. Changing from Coal to Oil, Robert Sibley and Chas. H. Delany. Jl. Electricity, vol. 44, no. 4, Feb. 15, 1920, pp. 175-177, 5 figs. Comparison of cost of fuel oil with that of coal of various heating values.

Coal vs. Oil Performance Chart, L. C. Lichty. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 651-652, 2 figs. For determining amount of saving when changing from coal to oil or vice versa.

Will Fuel Oil Continue to be Burned for Steam Making? Eugene McAuliffe. Oil News, vol. 8, no. 13, June 5, 1920, pp. 31-36. Urges that work of shifting back to coal be begun at once because, it is claimed, oil resources of United States are being rapidly exhausted.

Coke for. The Use of Lump Coke for Steam Production (Die Verwendung von gestücktem Koks zur Dampferzeugung), Alfred Stöber. Stahl und Eisen, vol. 39, no. 20, May 15, 1919, pp. 525-531, 4 figs. Article refers to publication on this subject by writer in Stahl und Eisen of Aug. 24, 1916, pp. 820-825 and relates his experiences after this period with coke fuel. Comparison of Steinmüller, Babcock and Siller types of furnace.

Excess Air. Some Observations in Regard to Estimating Excess Air in Investigations of Furnace-Firing (Einige Bemerkungen zur Luftüberschusszahl bei Feuerungsuntersuchungen), H. Hilliger. Zeitschrift für Dampfkessel und Maschinenbetrieb, vol. 42, no. 41, Oct. 10, 1919, pp. 313-315. Claims that approximate equations are often unreliable and points out value of clear and simple form of equations.

German Practice. New Patents in Boiler-Firing Practice (Neue Patente auf dem Gebiete der Dampfkesselfeuerung), A. Pradel. Zeitschrift für Dampfkessel und Maschinenbetrieb, vol. 42, no. 41, Oct. 10, 1919, pp. 315-317, 4 figs. Describes new process in use at Siemens-Schuckert works near Berlin, in which the cooling of ashes is effected in such a manner as to avoid development of dust and disagreeable vapors; describes also new process by a Swiss engineer, F. Peyer, for establishing and regulating drafts.

Indiana and Illinois Coals. How to Burn Indiana and Illinois Coals, Osborn Monnett. Coal Trade Jl., vol. 51, no. 9, Mar. 3, 1920, pp. 243-245, 5 figs. Description of special types of boilers and settings that are said to give most efficient combustion of Middle-Western fuels.

Lignite. Burning Lignite on Forced-Draft Chain Grate, H. F. Gauss. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 798-799, 4 figs. Installation where lignite containing 33 per cent moisture is dried in induction zone at front of stoker.

When Pulverized, Even Lignite Can Be Satisfactorily Burned, Roy N. Buell. Coal Age, vol. 17, no. 17, April 22, 1920, pp. 799-801, 3 figs. Experimental pulverized-lignite plant erected at San Francisco under auspices of U. S. Fuel Administration. It is stated that evaporation of 9 lb. of steam from and at 212 deg. fahr. per lb. of fuel was secured in boiler of ordinary horizontal multitubular type rated at 50 hp.

Low-Grade Coals. Burning Low-Grade Coals of the Southwest, W. M. Park. Elec. World, vol. 75, no. 17, April 24, 1920, pp. 947-948, 4 figs. Operating and test results obtained with chain-grate settings of different types. Recommendations for companies using fuels available. Analyses of several varieties of southwestern coals.

Oil-Fired Boilers. Operating Oil-fired Boilers Efficiently, Robert Sibley and Chas. H. Delany. Elec. World, vol. 74, no. 21, Dec. 20, 1919, pp. 1100-1105, 7 figs. Conditions that must be avoided.

Oil-Fuel Installation. A Fuel-Oil Installation, H. A. Wilcox. Power Plant Eng., vol. 24, no. 10, May 15, 1920, pp. 501-506 and 527-531, 16 figs. Account of installing oil-burning equipment in boiler formerly operated with coal. Results of coal and oil tests.

Oil vs. Coal. See Coal vs. Oil.

Peat-Fuel. Evaporation Tests with Peat and Peat Coke (Verdampfungsversuche mit Torf und Torfkoks), H. Winkelman. Kraft und Betrieb, vol. 3, no. 12, Sept. 15, 1919, pp. 138-139. Showing construction of boiler in which tests were made, also measurements taken during tests, analysis of fuel and results of tests.

Pulverized Coal. See PULVERIZED COAL, Boiler Firing.

Russian Practice. Recent Firing Practice in Russia (Ueber neuere Feuerungen in Russland), G. v. Doepp. Zeitschrift für Dampfkessel und Maschinenbetrieb, vol. 42, no. 43, Oct. 24, 1919, pp. 329-331, 4 figs. Experiences with Strogonoff-Kirsch system. A. Lomschakoff's automatic heating system in use in metal factory at Petrograd is described as permitting all kinds of solid fuel to be employed and simultaneous use of solid and liquid fuel.

Small Anthracite on Stokers. Colliery Boiler Plant Satisfactorily Burns No. 2 Tank Barley, D. C. Ashmead. Coal Age, vol. 17, no. 10, Mar. 4, 1920, pp. 430-433, 7 figs. Describes boiler plant just completed near Wilkes-Barre, Pa., rebuilt during operation. Satisfactory results are said to be obtained by burning small-size anthracite on automatic stokers. Building is said to be kept cool even in summer by draft fans.

Smoke Abatement. Combating the Smoke Nuisance, with Particular Reference to the City of Saarbrücken and the Future Development of Fuel Economy (Die Bekämpfung der Rauchplage mit besonderer Berücksichtigung der Stadt Saarbrücken und die zukünftige Entwicklung der Brennstoffwirtschaft), F. Guth. Gesundsheits-Ingenieur, vol. 42, nos. 46 and 49, Nov. 15 and Dec. 6, 1919, pp. 472-477 and 497-506, 6 figs. Writer discusses cause and effect of great smoke nuisance in Saarbrücken, and concludes that only remedy lies, so far as it is technically and financially possible, in employing cokes, gaseous and liquid fuels and electricity instead of direct coal firing. Report of investigations carried out by Nat. Inst. for Hygiene and Infectious Diseases in Saarbrücken.

Reducing Smoke in Boiler Firing (Rauchverminderung in Kesselfeuerungen), Johann Jaschke. Feuerungstechnik, vol. 7, no. 23, Sept. 1, 1919, pp. 181-184, 9 figs. Following instructions are given for complete and smokeless combustion of volatile gases: (1) proper volume of air for complete combustion; (2) prompt and adequate mixing of air and volatile parts; (3) sufficiently high temperature in combustion zone.

Soot Abatement. Soot and Its Abatement by the Use of Salt, B. S. Murphy. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 322-326. Method of treatment and results from using common salt as obtained from actual experience in large railway power plant.

Stokers. See STOKERS.

Tests. Results of Forty-One Steaming Tests Conducted at the Fuel Testing Station, Ottawa, John Blizzard and E. S. Malloch. Canada Department of Mines, Bulletin no. 27, 1920, 83 pp., 41 figs. Tables and diagrams show: Quantity of fuel burned to generate a definite quantity of energy; amount of ash, clinker and refuse removed while generating same definite quantity of steam; fraction of total refuse which was withdrawn by cleaning and slicing from above grate bars; and difference in draft pressure below bars and in flue leaving boiler.

Wood Refuse. The Economy of Wood Refuse for Generating, Heating and Power Steam in Woodworking Plants (Die Wirtschaftlichkeit der Abfallholzverwendung zu Heiz- und Kraftdampf für Holzbearbeitungsbetriebe), M. A. Nüscheler. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 18, Sept. 30, 1919, pp. 142-144. Calculation of economy of steam-engine operation as load balance of boiler plant for use as motive power for sawmill machinery.

Woodshop Waste Runs Power Plant. Power Plant Eng., vol. 24, no. 17, Sept. 1, 1920, pp. 821-827, 9 figs. Four boilers at new works of General Motors Co. equipped for burning factory refuse.

[See also BLAST-FURNACE GAS, Power From; Use under Boilers; BOILER OPERATION; FUELS, Low-Grade; OIL FUEL, Burning; OIL FIRING, White System; PULVERIZED COAL; REFRACTORIES, Coke Ovens; STOKERS.]

BOILER FURNACES

See FURNACES, BOILER.

BOILER OPERATION

CO_2 Readings. Tables for Computing Combustion Data from CO_2 Readings. Power, vol. 51, no. 24, June 15, 1920, pp. 966-968, 1 fig. Chart is included showing effect of hydrogen in fuel on heat loss as indicated by CO_2 readings.

Combustion Control. Combustion-Control Apparatus for the Boiler Room (Verbrennungs-Kontrollapparate für das Kesselhaus). Der Praktische Maschinen-Konstrukteur, vol. 53, no. 11, Mar. 18, 1920, pp. 91-96, 9 figs. Details of the Ados apparatus which is claimed to so record CO_2 percentage content of combustion gases that with the use of a table it is possible to determine extent of fuel loss; and the Mono combustion-control apparatus, designed by H. Maihak Co., Inc., Hamburg, consisting of an absorption apparatus and recording instrument enclosed in a dust-proof cast-iron case, the door of which has a glass pane at the top through which the record of previous ten hours is visible, and which even in case of 50 analyses per hr. is said to give perfect results.

Hagan Combustion-Control Regulator. Power, vol. 50, no. 17, Oct. 21, 1919, pp. 610-611, 4 figs. System which regulates fuel and air supply in accordance with flow of steam.

Indicators for Carbon Dioxide and Oxygen in Air and Flue Gas, L. H. Milligan, D. O. Crites and W. S. Wilson. Dept. of Interior, Bur. of Mines, technical paper 238, 1920, 23 pp., 12 figs. Instruments designed in chemical research laboratory at Pittsburgh experiment station of Bureau of Mines.

Rate of Steam Flow to Regulate Boiler. Blast Furnace & Steel Plant, vol. 8, no. 3, Mar. 1920, pp. 208-210, 4 figs. Apparatus designed to control combustion primarily from variations in rate of steam flow. Reciprocating valve is used to control steam supply to stoker drive.

Control. Control of Boiler-House Operation (Betriebskontrolle im Kesselhaus), E. Nies. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 5, May 1920, pp. 113-121. Points out the heat losses to be considered and outlines plan of control.

Economy. See STEEL WORKS, Boiler Operation.

Efficiencies at High and Low Ratings. Developing High Overload Capacities. Power House, vol. 13, no. 15, Aug. 5, 1920, pp. 356-357 and p. 360, 4 figs. Particulars of tests run on water-tube boiler with horizontal baffling to determine efficiencies at high and low ratings.

Efficient. Efficient Operation of the Boiler Plant, John D. Morgan. Power, vol. 51, no. 24, June 15, 1920, pp. 957-961, 2 figs. Various types of stokers are treated as regards requirements of design, also effect of boiler feedwater temperature. Plant labor is considered and data and curves are presented that have direct bearing on boiler-room maintenance, together with suitable plant-record sheets.

Flue-Gas Analysis. See FLUE-GAS ANALYSIS.

Flue-Gas Temperature. Flue-Gas Temperature and CO_2 as a Guide to Furnace Operation, Charles C. Phelps. Power, vol. 51, no. 18, May 4, 1920, pp. 725-727, 2 figs. Special reference is made to oil burners.

Gas Works Plants. Gas Plant Boiler Practice, Carl B. Wyckoff. Gas Rec., vol. 17, no. 11, June 9, 1920, pp. 15-19, 8 figs. Gives practical suggestions for obtaining improved results in operation of steam boilers in gas works. It is maintained no boiler should operate to exceed sixty days without being thoroughly overhauled and cleaned, except in cases of extreme necessity.

Instruments. Sampling Tanks Versus Continuous

Recorders for Determining CO_2. Charles C. Phelps. Power, vol. 51, no. 8, Feb. 24, 1920, pp. 297-298, 2 figs. Discusses correctness of results of CO_2 determinations by different methods, explains some of common errors and suggests proper method of procedure.

Records. Efficient Operation of the Boiler Plant, John D. Morgan. Power, vol. 51, no. 22, June 1, 1920, pp. 868-873, 9 figs. Advantages of keeping records are pointed out and methods of doing it illustrated.

Steam Used by Jets. Exact Data on the Running of Steam Boiler Plants, D. Brownlie. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 71-74, 2 figs. Amount of steam used by steam jets. Tabulated results of experiment are given on supplement plate.

[See also BOILER FIRING.]

BOILER PLANTS

Coal Handling in. See COAL HANDLING, Boiler Plants.

Design. Design of Large Boiler Plants, J. Grady Rollow. Jl. Engrs. Club of Phila., vol. 37-8, no. 188, Aug. 1920, pp. 303-315, 10 figs. It is pointed out that engineers must thoroughly acquaint themselves with every condition which may affect operation of a boiler plant before they can intelligently undertake design. Principal influences are enumerated and discussed.

Factors in Design of Large Boiler Plants, J. Grady Rollow. Elec. Rev. (Chicago), vol. 77, no. 8, Aug. 21, 1920, pp. 276-280, 1 fig. Discussion of principal points affecting equipment of boiler plants of large capacity. Paper before Eastern Pennsylvania Chapter, American Society of Heating and Ventilating Engineers.

Efficient Operation. Modernization of Stationary Boiler Plants. Ry. Age (Daily Edition), vol. 68, no. 23b, June 10, 1920, pp. 1638-1644, 3 figs. It is suggested to eliminate air infiltration by plugging cracks and applying commercial boiler seal, to apply adjustable dampers in uptake of each boiler to permit draft control, to apply differential draft gage to each boiler, to institute system of periodical inspection of grates, brick walls and baffles, etc. Question of using pulverized coal is discussed and also that of using furnace designed to burn crushed coal. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

Large. A 10,000 H.P. Boiler Installation, Edward R. Welles, W. A. Shoudy and J. G. White. Southern Engr., vol. 32, no. 2, Nov. 1919, pp. 36-40, 6 figs. Details of mechanical plant installed by Texas company for mining of sulphur.

Layout. New Sinclair Boiler Plant at East Chicago, Ind. Power, vol. 51, no. 15, Apr. 13, 1920, pp. 576-580, 9 figs. Details of modern four-boiler plant serving refinery, designed for convenience of operation, accessibility, low labor requirements and efficiency. Principal results from test of one of 600-hp. boilers are summarized.

Moline, Ill. Moline Station Adds to Steam and Generating Capacity, Thomas Wilson. Power, vol. 51, no. 6, Feb. 10, 1920, pp. 208-214, 9 figs. Describes new boiler installation housed in building of reinforced concrete throughout, having large beam and column construction with brickwork filling in panels in side walls; some interesting features of which are outside breeching mounted on pedestals supported by roof beams made heavy enough for additional load; series of runways in boiler room provided to give ready access to all desired points, lack of complicated piping, etc.

Standardization. Standardization of Boiler Plants, Louis R. Lee. Power, vol. 51, no. 10, Mar. 9, 1920, pp. 374-378, 2 figs. Involves use of a unit design covering wide range of capacities, consisting of cross-drum boiler set singly with suitable stoker furnace and provided with direct-connected economizer.

Steel Works. Boiler Systems for Steel Works (Zur Frage des Kesselsystems für Hüttenbetriebe), H. Schömburg. Feuerungstechnik, vol. 8, no. 15, May 1, 1920, pp. 125-128, 3 figs. Writer recommends a more general use of high-capacity water-tube boilers in steel works and gives tabular data and other details concerning a number of plants most of which employ vertical-tube boilers of the Hannover Machine Construction Corp.

Studebaker, South Bend, Ind. New Studebaker Boiler Plant at South Bend. Power, vol. 52, no. 15, Oct. 12, 1920, pp. 568 572, 6 figs. Fifteen-million-dollar unit with initial capacity of 4160 hp., and well equipped with labor-saving devices and instruments to indicate operation.

Unit, Design of. Design of a Unit Boiler Plant, Louis R. Lee. Elec. World, vol. 75, no. 6, Feb. 7, 1920, pp. 316-319, 6 figs. Design that may be built in sections, each unit being complete in itself and able to render efficient, reliable and low-cost service with minimum investment.

BOILER PLATE

Properties at High Temperatures. Tensile Properties of Boiler Plate at Elevated Temperatures, H. J. French. Min. & Metallurgy, No. 158, Section 15, Feb. 1920, 11 pp., 8 figs. Work done at Bureau of Standards for committee of Eng. Division, Nat. Research Council. Changes in strength, ductility and other properties, resulting from increase in temperature from 70 to 870 deg. fahr., were observed in both firebox and marine types of plates.

BOILER SCALE

See BOILERS, Scale.

BOILER TUBES

Electric Welding of. See ELECTRIC WELDING, RESISTANCE, Boiler Tubes.

BOILERS

Air Leakage Through Settings. CO_2 Exploration to Detect Air Leakage, A. E. Grunert. Power, vol. 52, no. 2, July 13, 1920, pp. 54-56, 3 figs. Method of exploration for detecting air leakage and giving CO_2 conditions throughout boiler setting is presented. Its use in cases cited so reduced air infiltration that final overall efficiencies of 81 to 83 per cent were obtained.

Blow-Off Piping. The Boiler Blowoff, Charles L. Hubbard. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 755-758, 11 figs. Suggestions regarding installation and protection of blow-off piping.

Capacity. Relation of Boiler Heating Surface Area to Boiler Capacity, P. J. Dougherty. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 355-362, 3 figs. Comparison of rules given by various authors.

Coke-fired. See COKE, Heating and Power.

Corrosion. Corrosion in Locomobile Boilers and Its Prevention (Anfressungen an Lokomobilkesseln und ihre Bekämpfung), H. Reichelt. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 11 and 12-13, Mar. 12 and 26, 1920, pp. 81-82 and 90-92, 12 figs. Describes typical corrosions occurring in boilers with suspended fireboxes after prolonged operation and careless attendance; and in boilers with cylindrical fireboxes and removable pipe system. A graphite-tar coating is recommended for outside of smokebox tube wall and for firebox base in boilers with suspended firebox.

Pitting and Corrosion in Boilers and Econo-

misers, F. F. Vater. Mech. World, vol. 67, no. 1772, Jan. 2, 1920, pp. 9-10. Survey of theories explaining corrosion and suggestions concerning use of preventives.

Removal of Gases from Feedwater to Reduce Corrosion of Boilers (De l'influence du dégazage sur les corrosions), Gaston Paris. Chaleur & Industrie, no. 3, May 1920, pp. 152-162, 7 figs. Tests established that removal of oxygen from feedwater by chemical means was "sole absolute remedy against corrosion."

Design. How to Design and Lay Out a Boiler, William C. Strott. Boiler Maker, vol. 19, no. 12, Dec. 1919, pp. 358-360, 3 figs., and vol. 20, nos. 1, 5, 6 and 9, Jan., May, June and Sept. 1920, pp. 13-17, 7 figs., 129-132, 11 figs., 157-159 and 186, 8 figs., and 266-269, 5 figs. Dec.: Designing steam domes and drums; computing stresses in dished and flat heads; Jan.: Determination of length of longitudinal seams, calculation of single- and double-riveted rings; May: Safety valve; blow-off connection; June: Describes types of pressure gages used. Notes on designing setting, and determining allowable stresses in bracket rivets; Sept.: Method followed in designing structural work for boiler settings. Discussion of various types of beams and columns.

Electrically Heated. Electrically Heated Boilers and Heat Storage. Eng., vol. 109, no. 2823, Feb. 6, 1920, pp. 170-172, 6 figs. Tests conducted by Swiss Association of Steam Boiler Proprietors. In watertube boilers nichrome spirals were placed within tubes and 770 kg. calories were rendered useful per kw-hr., that is, satisfactory efficiency of about 90 per cent was obtained.

Electrically Heated Steam Boilers and Heat Storage Tanks (Ueber elektrisch geheizte Dampfkessel und Wärmespeicher), E. Höhn. Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, nos. 6 and 7, Mar. 31 and Apr. 15, 1920, pp. 44-46, and 50-52, 13 figs. Also in Schweizerische Bauzeitung, vol. 74, nos. 19 and 21, Nov. 8 and 22, 1919, pp. 233-236 and 260-263, 17 figs. Discussion of electrode boilers and hot-water storage for generation of steam. Description of heat storage by means of oil, by concrete and hot water with heat transmission by oil, and with tube evaporators. Notes on hot-water heating, and economic problems in connection with conversion of electric current into heat. Address before Swiss Soc. of Steam Boiler Masters.

Electric Boilers (Riscaldamento elettrico). Industria, vol. 34, no. 12, June 30, 1920, pp. 318-319, 9 figs. Sulzer boilers. Electrodes are placed directly in water, 8000-volt alternating current being employed.

Electric Heating (Note relative au chauffage électrique), R. de la Brosse. Revue générale de l'Electricité, vol. 8, no. 11, Sept. 11, 1920, pp. 344-345. Efficiency of electric heating for industrial purposes is studied from experiences in Switzerland where electricity is being used for heating boilers.

Electric Heating for Industrial Purposes (Elektrische Heizung in der Industrie), H. Immerschitt. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 18, 19, 20 and 21, Apr. 30, May 7, 14 and 21, 1920, pp. 129-131, 139-141, 147-149 and 155-157, 29 figs. Notes on hot water and steam generators with electrode heating. Includes abstracts of paper by Rutgers in Le Génie Civil (no. 9, 1919) on employment of electric heating in industrial works and from paper by E. Höhn in Schweiz. Bauzeitung (nos. 19, 20 and 21, 1919) on electrically heated steam boilers and heat-storage tanks.

Making Steam Electrically in Switzerland, E. J. Constam-Gull. Power, vol. 52, no. 15, Oct. 12, 1920, pp. 596-598, 5 figs. Performance data on electrically fired steam boilers in Switzerland. Description of boilers.

Recent Applications of the Revel Electric Boiler in Swiss Industries (Neuere Anwendungen der elektrischen Revel-Kessel in der Schweizerischen Industrie, E. G. Constam-Gull. Schweizerische Bauzeitung, vol. 76, nos. 4 and 5, July 24 and 31, 1920, pp. 42-44 and 54-55. 9 figs. Results of experiments with a Revel boiler carried out at the instigation of the Swiss Assn. of Steam Boiler Masters.

Revel Electric Boiler (La production de la vapeur par l'électricité. Chaudière à chauffage électrique, système Revel), E. G. Constam-Gull. Génie Civil, vol. 77, no. 10, Sept. 4, 1920, pp. 193-195, 3 figs. Heating is effected by passage of alternating current through the water. A boiler 2.5 meters high and 0.6 meter in diameter, fed with current at 500 volts, gives per hour 550 kg. of steam at 15 kg. per sq. cm. Translated from Schweizerische Bauzeitung.

The Growing Importance of the Electric Heating of Steam Boilers, etc. (Die erhöhte Bedeutung der elektrischen Beheizung von Dampfkesseln u. dgl.), H. Wintermeyer. Elektrotechnischer Anzeiger, vol. 37, nos. 80 and 81, May 19 and 20, 1920, pp. 351-352 and 355. 3 figs. Two heating methods for electrically heated boilers are described: namely, resistance heating, in which the heat originating in the flow of electric current through a conductor is used for heating purposes; and electrode heating, in which current flowing between electrodes heats the water. Various systems according to both methods are described as well as electrically heated boilers for heat storage.

Emmet Mercury. See Mercury.

Equivalent Evaporation. Equivalent Evaporation, J. S. A. Johnson. Power, vol. 51, no. 1, Jan. 6, 1920, pp. 28-30, 2 figs. Proposes abolishing term factor of evaporation "because it is seldom that the water levels are the same at the end as at the beginning of a test," and defining equivalent evaporation as total heat absorbed by boiler in B.t.u. divided by 970.4.

Explosions. See BOILER EXPLOSIONS.

Feed Pumps for. See PUMPS, Boiler-Feed.

Feedwater. See BOILER FEEDWATER.

Firing. See BOILER FIRING.

Furnaces. See FURNACES, BOILER.

Gas-Fired. Gas-Fired Boilers. Gas World, vol. 72, no. 1857, Feb. 21, 1920, pp. 157-158, 2 figs. Recently published patent specifications describing new method of applying gas burners to multitubular steam generators.

Heat-Balance Calculations. Calculation of Heat Balance by Means of Oxygen and Nitrogen Contents of Fuel (Influence de l'oxygene et de l'azote contenus dans un combustible sur le calcul rapide du bilan thermique), P. de Groote. Chaleur & Industrie, no. 3, May 1920, pp. 184-188, 2 figs. Ternary diagrams showing compositions of principal fuels of the world, that is, coals, lignite, peat, etc.

Heat Transmission in. See HEAT TRANSMISSION, Boiler Flues.

Heating, Cracking of. The Cracking of Cast-Iron Sectional Boilers (Das Zerspringen der gusseisernen Gliederkessel). Gesundheits-Ingenieur, vol. 42, no. 52, Dec. 27, 1919, pp. 525-526, 4 figs. Writer explains causes of cracks which, he claims, can be prevented by the equalization of the water temperatures and avoiding or reducing incrustation, and suggests how this can be accomplished.

Height Above Grate. Correct Height of Return-Tubular Boiler Above the Grate, Henry Misostow. Power, vol. 51, no. 26, June 29, 1920,

pp. 1034-1036, 4 figs. It is stated that for best results with bituminous coal, shell of return-tubular boiler should be set as near fire as possible and still provide ample room for gases. Suggestions for determining best distance from shell of boiler to grate in any particular case are given.

Horizontal Baffling. Boiler Plant Practice. Refrigerating World, vol. 55, no. 7, July 1920, pp. 21-23, 4 figs. Tests conducted on one unit of installation of boiler plant to ascertain whether arrangement of horizontal baffling suitable for attaining high capacities would prejudice efficiencies obtainable at lower ratings.

Horizontally Baffled Boilers. Power Plant Eng., vol. 24, no. 17, Sept. 1, 1920, pp. 834-836, 4 figs. Describes series of four tests conducted on one unit of installation to ascertain whether arrangement of horizontal baffling suitable for attaining high capacities would prejudice efficiencies obtainable at lower ratings. It was found that arrangement of baffling which is especially suitable for obtaining maximum capacities does not affect adversely efficiencies obtained at lower ratings.

Tests on Large Horizontally Baffled Boiler, Textile World Jl., vol. 58, no. 6, Aug. 7, 1920, pp. 115-117, 4 figs. Tests conducted on boiler unit to ascertain whether arrangements of horizontal baffling suitable for attaining high capacities would prejudice efficiencies obtainable at lower ratings. High overload capacities were obtained with type of boiler and arrangement of baffles used.

Gage Glasses. Gage Glasses, H. E. Waverly. Southern Engr., vol. 32, no. 5, Jan. 1920, pp. 74-77, 11 figs. How to prevent their breaking.

Inspection. Value of Steam Boiler Inspection at Mines, H. M. Motherwell. Coal Industry, vol. 3, no. 9, Sept. 1920, pp. 437-440. Statistics are included which show that one boiler in seven is defective, one in three has scale, and one in seventy is dangerously affected.

Locomotive. See LOCOMOTIVE BOILERS.

Marine. See MARINE BOILERS.

Mercury. The Emmet Mercury Boiler. Power, vol. 52, no. 5, Aug. 3, 1920, pp. 167-168, 1 fig. on supp. plate. Binary-vapor power plant using mercury vapor and steam.

Mill. Economical Operation of Mill Boilers, W. E. Snyder. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 568-571. Analysis of heat losses in boiler and stack, preparation of coal, training of operating crews and forced blast for bituminous coal are recommended. Paper read before Engrs. Soc. of Western Pa.

Operation. See BOILER OPERATION.

Patches. Diagonal and Horseshoe Boiler Patches, R. J. Furr. Boiler Maker, vol. 20, no. 7, July 1920, pp. 189-191. Diagonal boiler patches, it is stated, show greater efficiency than the longitudinal type. Relative advantages of horseshoe patches are discussed.

Performance. Systematic Study of Boiler Performance. Power, vol. 50, no. 18, Oct. 28-Nov. 4, 1919, pp. 662-664, 6 figs. Practice of Emergency Fleet Corp.

Piping. Machinery and Pipe Arrangement, C. C. Pounder. Mech. World, vol. 66, no. 1719, Dec. 12, 1919, pp. 283-284, 2 figs. Arrangement of boiler room.

Radial Stays. Preparation and Installation of Radial Stays. Boiler Maker, vol. 20, no. 5, May 1920, pp. 121-124, 2 figs. Description of radial stays, followed by notes on practical design for radial stay holes, allowance when punching holes, treading and tapping holes for radial stays.

Repairing. See OXY-ACETYLENE WELDING, Boilers; Boiler Repairs.

Resetting. Resetting Return Tubular Boilers, C. R. Weihe. Coal Age, vol. 17, no. 7, Feb. 12, 1920, pp. 308-309, 2 figs. Examples of raising boiler sheet.

Scale. Effect of Incrustation on Action and Safety of Steam Boilers (Der Einfluss des Kesselsteins auf die Leistung und Sicherheit der Dampfkessel), H. Dienlein. Zeitschrift des Bayerischen Revisions-Verein, vol. 23, no. 20, Oct. 31, 1919, pp. 159-160, 1 fig. Presents curve and table showing effect of incrustation on heat utilization. Discusses article by F. Krauss in Zeitschrift der Dampfkesseluntersuchungs- und Versicherungsgesellschaft in Wien (Vienna) 1918, no. 2.

Prevention of Scale in Steam Boilers, W. H. Porter. Mech. World, vol. 67, no. 1729, Feb. 20, 1920, pp. 121-122. To avoid excessive concentration of soluble salts in boiler, it is pointed out that water must be blown out daily to keep density down to limit depending upon type of boiler, working pressure, and character of water.

Soot Removal. Removing Boiler and Stack Soot with a Steam Jet, Guy S. Hamilton. Elec. Rev. (Chicago), vol. 76, no. 25, June 19, 1920, pp. 1027-1028, 4 figs. Construction and operation features of steam-jet conveyor, similar to steam ash conveyor, for disposal of soot from bottom of stacks, rear of boilers and from economizers.

Stokers. See STOKERS.

Testing. Boiler and Furnace Testing, Rufus T. Strohm. Dept. Interior, Bur. Mines, Tech. paper 240, 1920, 23 pp., 3 figs. Reprint of Eng. Bul. No. 1, U. S. Fuel Administration.

Vertical. Small Vertical Boilers, Chas. C. Wade. Eng. & Indus. Management, vol. 3, no. 22, May 27, 1920, pp. 685-688, 3 figs. Description and illustrations of the "Cochran," "Essex" and "Blake" vertical multitubular boilers, any one of which is said to be greatly superior in efficiency to common vertical boiler. Points on selection, covering and firing of vertical boilers.

Waste-Heat. Waste Heat Boilers, D. S. Jacobus and Arthur D. Pratt. Proc. Engrs. Soc. Western Pa., vol. 36, no. 4, May 1920, pp. 221-234 and (discussion) 235-242. Factors in determination of proper number of passes to be offered in waste-heat work. Savings effected by waste-heat boilers.

Waste-Heat Boilers (Ueber Abhitzekessel), B. Schapira. Feuerungstechnik, vol. 8, no. 11, Mar. 1, 1920, pp. 93-94, 2 figs. Details of two waste-heat boilers of the Rodberg type, one with horizontal exhaust feedwater heater and the other with a vertical one, the tube systems of both of which are removable, but in special cases can be made fixed.

Water Circulation. Improvement of Water Circulation in Boilers (Neuzeitliche Kesselwasser-Umlaufverbesterung), M. Buchholz. Elektrotechnischer Anzeiger, vol. 36, no. 53, 54 & 57, June 1, 3 & 10, pp. 243-244, 249-250 and 263-264, 7 figs. Details of Kunert type of circulating device.

Water-Tube. See BOILERS, WATER-TUBE.

Welding. See OXY-ACETYLENE WELDING; WELDING, Boilers.

[See also BOILER ROOMS; BOILER PLANTS; DRAFT, Indicators; INJECTORS; PRESSURE VESSELS; STEAM GENERATORS.]

BOILERS, WATER-TUBE

Baffle Walls. Baffle Walls of Water-Tube Boilers (Die Lenkwände von Wasserrohrkesseln), H. Pradel. Elektrotechnischer Anzeiger, vol. 36, no.

105, Sept. 30, 1919, pp. 497-499, 7 figs. States that transmission of heat and efficiency of boiler depend upon proper installation of baffle walls.

Baffles. One-Piece Baffles for Water Tube Boilers. Universal Engr., vol. 31, no. 6, June 1920, pp. 41-42, 5 figs. Ideal baffle arrangement, it is pointed out, includes gastight baffles of proper shape and slope to give uniform gas velocity, as illustrated, and it is claimed that baffles made with plastic firebrick remain permanently gastight and last as long as boiler.

Bumped Heads. The Calculation of Bumped Heads for Water-Tube Boilers (Zur Berechnung gewölbter Böden für Rauchröhrenkessel), H. Reichelt. Dinglers Polytechnisches Jl., vol. 335, no. 5, Mar. 6, 1920, pp. 51-52, 1 fig. In writer's opinion, in order to avoid leaks in tubes, a certain elasticity of the heads against variable heat expansions between tubes and shell is expedient, and too stiff heads would be injurious.

Care. Causes and Prevention of Destruction of Water-Tube Boilers in Turbine Operation (Zerstörungursachen an Wasserrohrkesseln im Turbinenbetrieb und Gegenmassnahmen). Zeitschrift für Dampfkessel und Maschinenbetrieb, vol. 42, no. 28, July 11, 1919, pp. 209-212, 2 figs. As preventive against electrolytic action, which is said to be one cause of destruction, Cumberland process is recommended and explained.

Corrosion. Corrosion in Steam-Turbine Equipment of Stationary Plants (Ueber Korrosionen in Dampfturbinenbetrieben stationärer Anlagen), M. R. Schulz. Zeitschrift für Dampfkessel und Maschinenbetrieb, vol. 42, no. 46, Nov. 14, 1919, pp. 353-357, 10 figs. Reference is made to previous article in same journal (June 27) on causes for destruction of water-tube boilers in turbine installations on shipboard, and writer seeks to demonstrate that all experiences in ship-installations are not applicable to stationary or land plants as circumstances in both cases are fundamentally different.

E.F.C. Marine. Emergency Fleet Corporation Water-Tube Boilers for Wood Ships—II, Henry Kreisinger. Universal Engr., vol. 31, no. 6, June 1920, pp. 33-38, 7 figs. Presents some of results, with aid of charts, of special investigations conducted by Fuel Section of Bur. of Mines in connection with tests of three-pass and four-pass marine boilers, and outline diagrams illustrating methods of testing these boilers are given.

Water-Tube Boiler for Wood Ships, F. W. Dean. Power Plant Eng., vol. 24, no. 4, Feb. 15, 1920, pp. 233-236, 2 figs. Results of test of tests of four-pass boiler equipped with two underfeed stokers.

Houghton's Patent. Houghton's Patent Water-Tube Boilers. Steamship, vol. 32, no. 376, Oct. 1920, pp. 87-88, 6 figs. Invention relates to water-tube boilers of type in which down-comer and up-comer tubes communicate with common water vessel. Water drum is fitted with guide tube arranged eccentrically therein so that water from down-comer tubes passes under or round said guide tube before reaching up-comer tubes, thereby ensuring uninterrupted flow in direction required.

Renewal of Parts. The Renewal of Tubes. Headers and Baffles in Water Tube Boilers (Das Auswechseln der Röhren, Kammern und Lenkwände bei Wasserrohrkesseln), Feuerungstechnik, vol. 8, no. 22, Aug. 15, 1920, pp. 181-184, 12 figs. Description of methods and tools employed.

Tubes. Segregation in Bars for Steel Tubing, Harold D. Newell. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 745-746, 4 figs. Results of examination for segregation in acid and basic steel ingots for boiler-tube steel with and without additions of aluminum in ladle. It is concluded that when no aluminum is added, excessive segregation usually occurs down central part of ingot anywhere from 6 in. from top to half-way down entire ingot, sulphur tending to segregate the most, then phosphorus, carbon and finally manganese.

Vertical. Investigations of Vertical Water-Tube Boilers (Untersuchungen an Steilrohrkesseln), Friedrich Münzinger. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 21-22, 23-24 and 25, May 29, June 12 and 19, 1920, pp. 393-398, 432-433 and 453-457, 24 figs. Based on investigation of the seven types installed at the Golpa central power station, certain ideas for construction of large steam boilers for low-grade lignite are developed, followed by discussion of a method for calculation of the water circulation in double-headed and vertical water-tube boilers.

[See also FURNACES, BOILER; LOCOMOTIVE BOILERS.]

BOLTS

Initial Tension in. The Case of Initial Tension, R. Fleming. Eng. & Contracting, vol. 53, no. 12, March 24, 1920, pp. 320-324, 6 figs. Mathematical discussion of records developed in bolts and rivets already under initial stress by addition of suspended load. Formulæ derived show that suspended load always adds to initial stress, but it is said that in actual practice as long as initial stress is not exceeded by the pull, tension in bolt or rivet will not exceed initial stress by more than 10 or 12 per cent.

Standards for. Standards for Bolts, Machine Screws and Nuts of 2.5-mm. to 12-mm. Diameter Established by the Union of Electrical Syndicates (Unification des boulons, vis et écrous décolletés de 2.5 à 12 mm. de filetage établie par l'Union des Syndicates de l'Electricité). Revue générale de l'Électricité, vol. 7, no. 17, April 24, 1920, pp. 556-558, 1 fig. Notable feature of standards is sensible reduction of heads. Standards were adopted on Jan. 7, 1920.

Tension. Charts for Design of Tension Bolts and Screws, H. M. Brayton. Am. Mach., vol. 51, no. 20, Nov. 13-20, 1919, pp. 890-892. Four principal ways are enumerated in which bolt subjected to tension can fail: (1) bursting of nut, (2) failing of threads by shearing, (3) failing of threads by cantilever action, and (4) failing of shank by tension causing rupture across root diameter of thread.

BOMBARDMENT

Aerial. See AERIAL BOMBARDMENT.

BOMBS

Trajectories, Photographing. The Photography of Bomb Trajectories, A. Wm. Duff. Jl. Worcester Polytechnic Inst., vol. 23, no. 1, Nov. 1919, pp. 24-33, 3 figs. Procedure in taking photographs.

BONUS SYSTEMS

Advantages. Wages and Bonus Systems, Herbert C. Armitage. Eng. & Indus. Management, vol. 2, no. 19, Nov. 6, 1919, pp. 581-583. Advantages of employing piecework system.

Analysis of. Analysis of Bonus Systems of Wages (Analisi dei sistemi di salario a premio), A. Primatesta. Supp. of Rivista Tecnica delle Ferrovie Italiane, 1919, pp. 3-82, 57 figs., partly on 6 supp. plates. Technical comparison with suggestions in regard to selecting system according to character of industry.

Classification. Wages and Bonus Systems, H. C. Armitage. Eng. and Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 714-716, 1 fig. Systems whereby direct personal effort may be rewarded are classified into (1) piece work, (2) premium and (3) efficiency.

Comparison with Efficiency Systems. Wages and Bonus Systems, Herbert C. Armitage. Eng. & Indus. Management, vol. 3, no. 6, Feb. 5, 1920, pp. 163-165. Comparative study of bonus and efficiency systems of wage payment.

Foundry Output Increased by. Efficiency Methods Triple Foundry Output, C. E. Wright. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 849-855, 13 figs. It is stated that Bullard Machine Co., Bridgeport, Conn., greatly increases production by bonus plan. Daily record per man is said to be up from 360 to 1020 lb.

Maxi-Pay Plan. A Bonus Plan that Works, Fred H. Colvin. Am. Mach., vol. 52, no. 22, May 27, 1920, pp. 1137-1139. Maxi-Pay production bonus plan based upon allotment of established standard time for unit production. Experience of Bullard Machine Tool Co., Bridgeport, Conn.

Premium Schemes. Wages and Bonus Systems, Herbert C. Armitage. Eng. & Indus. Management, vol. 3, no. 3, Jan. 15, 1920, pp. 66-69, 2 figs. Comparison of Rowan system with other premium schemes.

Shipbuilding. Wage Incentive Plans in Ship Building, Stephen G. Rockwell. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 295-300. Three 7800-ton ships built successively on the same way, took 1,200,000, 600,000 and 400,000 man-hours, respectively. Plans according to which work was done on last ship are outlined.

Use in Stimulating Production. Wages and Bonus Systems, H. C. Armitage. Eng. & Indus. Management, vol. 3, no. 11, March 11, 1920, pp. 323-325, 1 fig. Opinion is expressed that profit sharing, copartnership, and collective bonus do not stimulate production but encourage economy in material and promote open-mindedness toward new methods of production, manufacture or management; and that piece work, if rightly applied, will stimulate increased production per worker.

BOOSTERS

Back E. M. F. A Back E. M. F. Booster, G. Bowron. Elecn., vol. 83, no. 2162, Oct. 24, 1919, pp. 468-470, 5 figs. Observations made in connection with experiments illustrative of back e.m.f. of direct-current motor.

BOREHOLES

Calking. Tapping Water by Diamond Drill Holes, Edmund B. Dow. Proc. Australasian Inst. Min. & Metallurgy, no. 34, June 30, 1919, pp. 1-7, 4 figs. partly on supp. plate. Method of calking boreholes.

BORING

Earth-Piercing Machine. Thrust Boring in Earth. Engr., vol. 129, no. 3354, Apr. 9, 1920, pp. 369-371, 4 figs. Machine invented by Capt. A. R. Mangnall and made by Hydraulic Eng. Co., Chester, England, which is said to be built to pierce a hole 4 in. in diameter and 150 ft. long horizontally through heavy clay in half an hour. Machine is said to operate on principle of thrusting a stick into clay.

BORING MACHINES

Crankcase Bearings. A Machine for Boring Line Bearings, J. V. Hunter. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 162-163, 4 figs. Machine used for boring and reaming bearings of automotive crankcase.

Operation. Unusual Methods of Securing Extreme Accuracy, A. L. DeLeeuw. Am. Mach., vol. 52, no. 12, March 18, 1920, pp. 595-599, 17 figs. Preliminary machine work necessary to locating and boring of parallel long holes.

Speed Standardization. Recommendations for the Standardization of Speed of Boring Machines (Vorschläge über Drehzahlnormung von Bohrmaschinen), Karl Meller. Betrieb, vol. 2, no. 9, Apr. 1920, pp. 221-226, 6 figs. Writer recommends a standard range for speed graduation which is applicable to boring machines of all sizes, by establishment of which advantageous production results are obtained.

Tables for. Recent Machine Tool Developments, Joseph Horner. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 813-816, 22 figs. Boring-machine tables.

Vertical. A New Vertical Boring and Turning Mill. Eng. Production, vol. 1, no. 7, July 1920, p. 258, 2 figs. Details of latest Wilkinson 20-in. duplex vertical boring and turning mill with gear-box drive, which is said to permit rapid handling of medium-sized jobs.

BOXES

Wooden Containers. Report of Committee D-10, Annual Meeting, Am. Soc. Testing Matls., June 22-25, 1920, 11 pp., 6 figs. Tentative specifications for wooden boxes, nailed and lock-corner construction.

BRAKES

Air, Kunze-Knorr. Kunze-Knorr Continuous Compound Compressed Air Brake (Le frein continu compound a air comprimé système Kunze-Knorr), Lefeuvre. Génie Civil, vol. 76, no. 22, May 29, 1920, pp. 492-497, 52 figs. partly on supp. plate. System installed in German railway freight cars during war, and recently adopted by Swedish railways.

Automatic Vacuum. The Automatic Vacuum Brake on Goods Trains. Ry. Gaz., vol. 31, no. 26, Dec. 26, 1919, p. 859, 1 fig. Testing practice of Great Indian Peninsula Ry.

Back-Steam. The Use of Back-Steam as a Brake; Its Power and Its Present Use, A. Herdner. Bul. Int. Ry. Assn., vol. 1, no. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 197-206. Objections against using back-steam as brake are examined and separately discussed.

Brake Lever Design. Brake Lever Design, Victor M. Summa. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 342-343, 6 figs. Examples showing effect of direction of brake-shoe pressure on brake rigging design.

Electromagnetic. Theory of Electromagnetic Brake (La teoria del freno electromagnético), Richard Gans. Contribución al Estudio de las Ciencias físicas y matemáticas, Universidad nacional de la Plata, vol. 2, no. 43, Sept. 1919, pp. 391-412, 5 figs. Also in Boletin de la Asociación Argentina de Electro-Técnicos, vol. 5, no. 7, July 1919, pp. 103-111, 4 figs. Behavior of metallic sphere turning in magnetic field is determined theoretically. Equations for braking couple are derived and stability of motor provided with electromagnetic brake is discussed.

Friction. On Friction Brakes with Straps Stiffened by Wood Blocks, Walter Pitt. Jl. Instn. Mech. Engrs., no. 7, Oct. 1919, pp. 587-592, 2 figs. Modification of formula for brake-bands in order to make it applicable to case when strap has wooden blocks rigidly attached to it.

Freight-Train. Continuous Brakes for Heavy Goods Trains. Ry. Gaz., vol. 32, no. 6, Feb. 6, 1920, pp. 189-193, 9 figs. "Loud" brake which provides for augmentation of brake power, when desired, on loaded cars fitted with automatic vacuum brake. Device is being used on Great Indian Peninsula Ry.

Development and Arrangement of Brakes for

Through Freight Trains (Die Ausbildung und Einrichtung der durchgehenden Güterzugbremse), G. Oppermann. Annalen für Gewerbe und Bauwesen, vol. 85, no. 2, July 15, 1919, pp. 13-16, 6 figs. Details of Kunze-Knorr and Oppermann compound brakes.

Hydraulic. The Junker Water Brake (Die Wasserwirbelbremse Bauart Junkers), Oel- u. Gasmaschine, vol. 17, no. 4, Apr. 1920, pp. 53-54, 3 figs. Brake developed by the Hugo Junkers Experimental Instn., Aachen, consisting of a stator chamber through which water flows and which is placed directly on shaft itself or concentric thereto; its circumference is provided with pins in one or more rows, while within stator and firmly keyed to shaft is the rotor which is also provided with pins extending between those of the stator; when water enters between pins a water ring is formed through which the rotor pins move constantly.

Kunze-Knorr. Tests of Kunze-Knorr Brake in Sweden (Statens järnvägars nya Godstågsbroms. Beskrivning av Kunze-Knorr-bromsen), Gustav Rydberg. Teknisk Tidskrift (Mekanik), vol. 50, nos. 9 and 10, Sept. 8 and Oct. 13, 1920, pp. 123-128 and 142-148, 46 figs., 15 on 5 supp. plates. Brake as used for freight trains in Sweden.

See also Air, Kunze-Knorr.

Pneumatic vs. Electric. Pneumatic and Electric Brakes (Druckluftbremse und elektrische Bremse), H. Sauveur. Verkehrstechnik, vol. 37, no. 9, Mar. 25, 1920, pp. 126-130, 5 figs. Comparison of their relative merits, from which it is concluded that none of the electric brakes possesses the safety of operation of the air brake. Results of tests to determine operation movements in the handling of brakes are shown in illustrations.

Pneumatic vs. Suction. Freight Train Brakes (Zur Bremsung der Güterzüge), E. Cimonetti. Zeitung des Vereins deutscher Eisenbahnverwaltungen, vol. 60, no. 5, Jan. 21, 1920, pp. 53-55. Discussion of the relative merits of the pneumatic and suction air brakes.

Repairmen, Instruction of. Test Rack for Instructing Air Brake Repairmen, N. J. Cline. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 153-154. Used by Pittsburgh & Lake Erie for instructing air brake repairmen in method of testing car on repair track for defects in air-brake equipment.

Service-Release Emergency. Special Test of a Service-Release-Emergency Brake Application of the Automatic Straight Air Brake on the Virginian Railway. Ry. & Locomotive Eng., vol. 33, no. 6, June 1920, pp. 165-168, 20 figs. Presents diagrams which are exact reproductions of trainagraph records for a number of cars in train located at approximately uniform intervals, except at front and near the seventieth car.

Track. The "Eureka" Track Brake. Tramway and Ry. World, vol. 48, no. 14, Sept. 16, 1920, pp. 134-136, 5 figs. Combined track and wheel brake.

Train. Automatic Brakes (Selbsttätige Weichen), S. Abt. Zeitschrift für Kleinbahnen, vol. 26, no. 7, July 1919, pp. 337-344, 22 figs. Description of types used in suspended railways, conveyors, mine railways and funicular railways.

Identifying Defective Wagon Brakes. Ry. Gaz., vol. 31, no. 16, Oct. 17, 1919, p. 481, 3 figs. Device used by London and North Western Railway.

Report on Brake Shoe and Brake Beam Equipment. Ry. Age (Daily Edition), vol. 68, no. 24e, June 16, 1920, pp. 1851-1857, 9 figs. Designs proposed by Committee of Am. Railroad Assn., Mech. Section.

Triple-Valve. Automatic Straight Air Brake Company's Triple Valve. Ry. & Locomotive Eng., vol. 33, no. 5, May 1920, pp. 132-138, 10 figs. Details of its construction and operation.

BRAKING.

Electric. See STREET RAILWAYS, Braking.

Rack Mechanism. Braking Railway Vehicles on a Track, Partly Adhesive, Partly Rock-Operated (Veicoli F.S. con freno sulle ruote dentate per linee a dentiera a scartamento normale), Enrico Frassetti. Rivista Tecnica delle Ferrovie Italiane, vol. 17, no. 3, Mar. 1920, pp. 43-47. Bogies of cars were fitted with mechanism to engage rack, and on this were mounted brake-gear interconnected with brakes of track-wheels, and operated either from Westinghouse equipment or by hand wheel. Results of tests are given.

Regenerative. See REGENERATIVE BRAKING.

BRASS

Annealing. See Removal of Internal Stress.

Bar Stock, Weight of. See STEEL, Bar Stock, Weight of.

Cadmium in, Influence of. The Influence of Cadmium on the Properties of Brass, Leon Guillet. Foundry Trade Jl. & Pattern-Maker, vol. 22, no. 222, June 1920, pp. 459-460. Tabulated results of experiments with copper alloys containing from 55 to 70 per cent copper. Translated from Revue de Métallurgie.

Cobalt. Cobalt Brasses (Les laitons au cobalt), Léon Guillet. Revue de Métallurgie, vol. 17, no. 7, July 1920, pp. 494-500, 13 figs. Macrographic and micrographic analyses, and study of mechanical properties of alloys with different cobalt contents.

Corrosion. The Corrosion of Brass in Dilute Electrolytes, J. H. Reedy and Bertram Feuer. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 541-547, 4 figs. It was found in experiments that high concentration of electrolytes favored electrolytic corrosion in an additive way, and retarded, or even inhibited, complete corrosion. Elevated temperatures favored electrolytic corrosion, but diminished complete corrosion by diminution of dissolved oxygen. Contact with metals nobler than brass favored electrolytic corrosion and was without influence on complete corrosion.

Electrodeposition of. See ELECTROPLATING, Brass.

Extruded. Extruding Brass and Copper Rods. Machy. (Lond.), vol. 16, no. 415, Sept. 9, 1920, pp. 701-703, 7 figs. Methods and equipment.

See also Rod and Wire Manufacture; COPPER, Extruded Rods.

Gases, Influence of. The Influence of Gases on High-Grade Brass, T. G. Bamford and W. E. Ballard. Eng., vol. 110, no. 2855, Sept. 17, 1920, pp. 390-394, 6 figs. Experimental. It is concluded that in ordinary foundry practice, using coke-fired natural draught wind furnace, it is impossible to impair seriously mechanical properties of casting by overheating. It is said that cooling metal to within 40 deg. cent. of liquidus will certainly ruin mechanical properties of high-grade brass which has been melted in ordinary furnace atmospheres and will probably render casting porous. A minimum temperature of 1150 deg. cent. is recommended for casting tubes 50 : 29 : 1. (Abstract.) Paper read before Inst. of Metals.

Grading. Brass: Its Constitution and Impurities, F. S. Pile. Metal Industry (Lond.), vol. 16, no. 3, Jan. 16, 1920, pp. 46-50, 7 figs. Suggested grading of brass.

Hardness. See COPPER, Hardness.

Heat Treatment. The Heat Treatment of Beta Brasses, H. M. Brayton. Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 211-217, 15 figs. Study of relation between various physical properties of beta brasses as annealing and quenching temperature varies. Suggestions are given for procuring strong, ductile pieces.

Internal Stress, Removal of. The Removal of Internal Stress in 70:30 Brass by Low Temperature Annealing, H. Moore and S. Beckinsale. Metal Industry (Lond.), vol. 16, no. 14, Apr. 2, 1920, pp. 267-269, 4 figs. It was found in experiments that minimum times in which internal stress was completely removed by low-temperature annealing were: at 200 deg. cent., 96 hr.; 225 deg. cent., 48 hr.; 250 deg. cent., 5 hr.; 275 deg. cent., 1 hr.; 300 deg. cent., 20 min.; 325 deg. cent., 5 min. Internal stress was not removed and did not appear to be appreciably reduced by annealing at 100 deg. cent. for many weeks.

Lead in. Distinguishing Lead in Brass and Bronze, E. P. Gilligan and J. J. Curran. Iron Age, vol. 105, no. 10, March 4, 1920, pp. 657-658, 8 figs. Photomicrographs showing effect produced by ammonia etch of specimens of different compositions. It is concluded from their examination that only advantage of sulphide reagent lies in staining matrix a deep hue so that $SnCu_4$ stands out more prominently.

Distinguishing Lead in Brass and Bronze, O. A. Knight. Iron Age, vol. 105, no. 5, Jan. 29, 1920, pp. 327-328, 2 figs. Photomicrographs obtained with sulphide etching.

Manufacture. Seven Centuries of Brass Making, O. A. Kenyon. Am. Mach., vol. 53, no. 17, Oct. 21, 1920, pp. 755-761, 11 figs. Historic notes.

Melting. See ELECTRIC FURNACES, Brass.

Nickel. Copper, Zinc and Nickel Alloys (Sur les alliages de cuivre, de zinc et de nickel), Léon Guillet. Comptes rendus des Séances de l'Academie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 460-462. Experiments established that effect of nickel in brass is to raise position of transformation points and to facilitate its forging at high temperatures.

New Researches on Nickel Brass (Nouvelles recherches sur les laitons au nickel), Léon Guillet. Revue de Métallurgie, vol. 17, no. 7, July 1920, pp. 484-493, 17 figs. Macrographic and micrographic analyses, and determination of variation of strength and resilience with nickel content.

Pressings. See PRESSWORK, Hot-Brass Pressings.

Removal of Internal Stress. The Removal of Internal Stress in 70:30 Brass by Low Temperature Annealing, H. Moore and S. Beckinsale. Eng., vol. 109, no. 2829, Mar. 19, 1920, pp. 393-395, 4 figs. Paper read before Inst. of Metals.

Rod and Wire Manufacture. Making Brass Rods and Wire Illustrated, Otis Allen Kenyon. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1437-1440, 11 figs. Steps in extrusion and rolling processes.

60:40. Some Properties of 60:40 Brass, Cecil H. Desch. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 216T-221T, 10 figs. Data relating to rods from sixteen different manufacturers obtained in experiments carried out in Metallurgical Laboratory of University of Glasgow, and in University of Sheffield. Comparison of results leads to conclusion that arrangement of fine, fibrous α crystals, separated by comparatively small quantity of β, is the most desirable structure for machining purposes. This is said to be obtained by employing an alloy containing as nearly as possible 40 per cent of apparent zinc, and extruding at a moderate temperature.

Special. Special Brass (Les laitons speciaux), Léon Guillet. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs Civils de France, vol. 73, nos. 1, 2, 3, Jan.-March 1920, pp. 154-182, 25 figs. partly on supp. plate. Special brass is defined to be any copper-zinc alloy with which any other metal or other metals have been incorporated. Results of experimental determination of properties of such alloys are given, and a general theory of combinations of binary alloys with third metal is developed.

Specifications. The General Aspect of the Standardization of Metals and Alloys and the Status of the Present Work (Allgemeine Gesichtspunkte über Normung der Metalle und Legierungen und Stand der gegenwärtigen Arbeiten), H. Schulz. Metall u. Erz., vol. 17, no. 5, Mar. 8, 1920, pp. 119-125. Notes on the development of standards in machine construction and standardization of metals, with revised tables of specifications for brasses and bronzes. Address before Soc. of German Met. & Min. Engrs.

Standardization of. The Standardization of Metals and Metal Alloys. Metal Industry (Lond.), vol. 16, nos. 8 and 9, Feb. 20 and 27, 1920, pp. 141-143 and 161-163. Report submitted to German Committee for Standardization of Metals and Metal Alloys, dealing with standardization of most important brass and bronze alloys.

Strains in. Strains Existing in Copper-Zinc Alloys. Metal Industry (London), vol. 15, no. 26, Dec. 26, 1919, p. 527, 2 figs. Comparative study of strains existing in copper-zinc alloys (brasses) after quenching, and after hardening by cold working. Translated from Comptes rendus des Séances de l'Académie des Sciences.

[See also NON-FERROUS METALS, Flux Skimming.]

BRASS FOUNDING

Casting Losses. Reducing Casting Losses in the Brass Foundry, P. W. Blair. Can. Foundryman, vol. 11, no. 5, May 1920, pp. 121 and 42. Writer believes that by proper gating much of the trouble is overcome, but proper skimming and pouring are essential as well as properly proportioned patterns.

Electric-Furnace Melting. Developments in Brass-Melting, Otis Allen Kenyon. Iron Age, vol. 105, nos. 8 and 13, Feb. 19 and Mar. 25, 1920, pp. 527-530, 6 figs., and 880-883, 7 figs. Feb. 19: Uses of electric furnace in brass industry. Mar. 25: Electric casting shop of Bridgeport Brass Co., Bridgeport, Conn., is described as illustrating broad commercial scale of electric furnace use.

Electric Furnaces for Brass Melting. Mech. World, vol. 67, no. 1772, Jan. 2, 1920, p. 5. Comparative value of electric furnaces with furnaces heated with solid fuel or gas.

Electric Melting Shows Economy. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 845-850, 8 figs. Experience of brass foundry is said to have shown that yellow brass losses in electric furnace are so low that saving more than offsets their increased costs of process.

Electric Melting Shows Economy. Foundry, Costs. Elec. World, vol. 74, no. 21, Dec. 20, 1919, pp. 1107-1109. Actual operating costs and performance data from rotating non-ferrous furnace installed in jobbing brass foundry.

More Casting Shop Troubles and the Answer, W. J. Pettis. Elec. Furnace, vol. 1, no. 45, April-May 1920, pp. 12-13 and p. 17, 1

fig. Suggestions in regard to selection of type of electric furnace for brass manufacture.

English Practice. Notes on Brass Foundry Practice at Messrs. Vickers, Ltd., Barrow-in-Furness, H. B. Weeks. Eng., vol. 110, no. 2855, Sept. 17, 1920, pp. 389-390. Paper read before Inst. of Metals.

High-Tensile Brass. The Art of Casting in High Tensile Brass, Neil J. MacLean. Metal Industry (Lond.), vol. 16, no. 13, Mar. 26, 1920, pp. 249-256, 19 figs. Also in Engineering, vol. 109, no. 2829, Mar. 19, 1920, pp. 388-391, 12 figs. Experiments made by Glasgow firm to devise formula for manganese brass for manufacture of precision instruments for naval use, led to adoption of following composition: Copper 60 per cent, zinc 34, nickel 3, iron 2, lead 0.25, manganese 0.5 and phosphor-tin 0.25. Alloy is said to have breaking strength of 20 tons per sq. in., elastic strength of 10 tons per sq. in., and elongation of 15 per cent in 2 in. Paper read before Inst. of Metals.

Machine Molding in. Machine Molding in Brass and Aluminum Foundries, E. S. Carman. Brass World, vol. 15, no. 12, Dec. 1919, pp. 357-358, 5 figs. Suggested mechanical fixtures for increasing production.

Melting. Considerations Affecting Brass Melting in the Gray Iron Shop, R. R. Clarke. Metal Indus., vol. 17, no. 10, Oct. 1919, pp. 453-456, 2 figs. Concerning principally metal selection and mixing practice and position of crucible in pit furnace. Paper read before Am. Foundrymen's Assn.

[See also ELECTRIC FURNACES, Booth; Brass-Melting.]

BRASS FOUNDRIES

Pulverized Coal in. See PULVERIZED COAL, Brass Foundries.

[See also FOUNDRIES, Brass.]

BRASS GOODS

Standardization of. Standardization of Brass Goods for Services. Fire & Water Eng., vol. 67, no. 24, June 16, 1920, pp. 1267-1273. Letters from members of Am. Water Works Assn. on subject of taking up of matter at convention show that they are almost unanimously in favor of this action.

[See also GAGES, Brass Goods.]

BRASSES

Car-Journal, Lining. See CAR JOURNALS, Brasses, Lining.

BRAZING

See AEROPLANES, Construction.

BREAKWATERS

Shape, Influence of. Investigations of the Influence of the Shape of Breakwaters on the Coast Current and Sand Shifting in Front of Harbor Entrances (Untersuchungen über die Einwirkung der Form der Molen auf Kustenströmung und Sandwanderung vor der Hafeneinfahrten), H. Mussett. Zeitschrift für Bauwesen, vol. 70, no. 1-3, 1920, pp. 106-115, 2 figs. Results of investigations carried out in the Harbors of Colberg, Rügenwaldermünde and Stolpmünde.

[See also CAISSONS, Concrete.]

BREATHING APPARATUS

See MINE-RESCUE APPARATUS, Breathing Apparatus.

BREW KETTLES

Heat Transmission in. See HEAT TRANSMISSION, Mash Cookers and Brew Kettles.

BREWERIES

Equipment. The Brew-House of the Humbser Brewery in Furth (Bavaria), Th. Ganzenmüller. Eng. Progress, vol. 1, no. 1, Jan. 1920, pp. 19-24, 11 figs. Up-to-date equipment of modern brewery. Utilization of heat. Automatic brewing process.

BRICK

Belgian, Tests of. Note on the Manufacture of Brick in Belgium (Note sur la fabrication des briques du pays), L. Bonnet. Annales des Travaux Publics de Belgique, vol. 21, no. 3, June 1920, pp. 353-390, 7 figs. Tests on brick manufactured in Belgium, also on some made in Holland and on "Klinkaert" bricks. Tests were carried out at the State laboratory at Malines.

Cellular. Cellular Brick Construction (Kästelmauerwerk aus gebrannten Mauerziegeln), Ernst Noack. Tonindustrie-Zeitung, vol. 44, no. 35, Mar. 20, 1920, pp. 333-335, 1 fig. Revival of old form of masonry recommended as a practical and effective means of reducing cost of house building. Results of experiments show that in comparison with solid brick masonry an average saving of 19.5 per cent of bricks can be effected.

Clay. The Compressive Strength of Clay Bricks and Clay-Brick Masonry (Druckfestigkeit von Lehmsteinen und Lehmsteinmauerwerk), H. Gebauer. Tonindustrie, vol. 44, no. 32, Mar. 13, 1920, pp. 301-302, 2 figs. Gives results of tests carried out at the Bavarian Indus. Inst. at Nuremberg in tabular form.

Concrete. The Future of Concrete Brick in the East, Austin E. Potter. Concrete Products, vol. 18, no. 5, May 1920, pp. 23-25. Notes on existing plants, manufacturing costs, and capital investments.

German Standards. Brick Standards (Ziegelnormung). Tonindustrie-Zeitung, vol. 44, no. 11, Jan. 24, 1920, pp. 93-94. Regulations for the delivery and testing of masonry bricks as decreed by the Minister of Public Works in Germany, Dec. 8, 1919.

Paving. See PAVING BRICK.

Sand-Lime. Steam Consumption in Hardening of Sand-Lime Brick (Dampfverbrauch für die Kalksandsteinhärtung), B. Krieger. Tonindustrie-Zeitung, vol. 44, no. 17, Feb. 7, 1920, pp. 149-150. Results of experiments are said to show that maximum steam consumption during hardening for 10,000 bricks is from 1000 to 1200 kg. steam in first hour.

Slag-Lime. Manufacturing Slag-Lime Brick by a New Process at Illinois Plant. Brick & Clay Rec., vol. 55, no. 10, Nov. 4, 1919, pp. 858-859, 2 figs. Process is similar to that followed in manufacture of sand-lime brick.

Standard-Size. Why There Should be a Standard Size for Common Brick, William Carver. Brick & Clay Rec., vol. 56, no. 12, June 1, 1920, pp. 1105-1106. Paper read before Common Brick Manufacturers' Assn. at meeting held in Feb. when Assn. adopted 2¼ x 3¾ x 8 in. as standard-size brick.

BRICKMAKING

Burning. Burning Common Bricks in Producer-Gas Fired Continuous Kilns, Geo. Cutbush. Contract Rec., vol. 34, no. 4, Jan. 28, 1920, pp. 81-82. Advantages quoted are, ease of operation, economy of fuel, and uniformity of results.

Continuous Burning. Immense Saving with Continuous System of Burning. Brick & Clay Rec., vol. 56, no. 4, Feb. 10, 1920, pp. 322-325, 4 figs. Canadian plant is reported to use only 519 lb. of coal under favorable conditions to burn 1000 brick in round down-draft kilns.

Factors in. Important Factors in Red-Brick Manufacture, Robert W. Jones. Eng. & Min. Jl., vol. 109, no. 8, Feb. 21, 1920, pp. 490-491, 3 figs. Reasons are mentioned why common building brick cannot be made from any kind of clay. Emphasis is laid on necessity of chemical, mineralogical and mechanical tests, supplemented by geological exploration, in order to avoid costly failures.

BRICKYARDS.

Experimental Plant. Experimental Brick Plant of the Nova Scotia Steel & Coal Company, Ltd., A. Dawes. Iron & Steel of Canada, vol. 2, no. 10, Nov. 1919, pp. 269-271, 3 figs. Machinery consists of dry-pan clay mill, elevator, wire screens, pug mill, auger brick-machine, dies and wire brick-cutting machine.

Management. See INDUSTRIAL MANAGEMENT, Brickyards.

BRIDGE DESIGN

Arches. See Ornamentation.

Cantilever vs. Suspension. The Comparative Economies of Cantilever and Suspension Bridges, J. A. L. Waddell. Jl. Western Soc. Engrs., vol. 24, no. 4, Apr. 1919, pp. 187-214, 11 figs. Concluded that for exclusively railroad bridges economic limit for cantilever type of structure is that length which requires 4½ lb. of metal to carry one lb. of live load. For modern highway structure carrying also incidentally electric railway tracks this limit is set at 1000 ft. and for combined railway and highway structures limit is placed intermediate between limit for railway structures and that for highway structures.

Chords. The Calculation of the Buckling Resistance of the Chords of Through Bridges (Beitrag zur Berechnung der Knickfestigkeit der Gurtung offener Brücken), Chr. Vlachos. Eisenbau, vol. 11, no. 11, June 4, 1920, pp. 199-205, 8 figs. Buckling formulæ are derived under consideration of the non-continuously distributed frame resistances, which are also applicable to the small stiffness of the boom opposite the verticals.

Ornamentation. Bensalem Ave. Bridge—An Essay in Ornamentation. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 559-561, 6 figs. Details of design and construction of monumental concrete structure for Philadelphia Park system in which special attention was paid to appearance. Bridge is 585 ft. long, made up of central 100-ft. arch, two approach arches of 60 ft. span, and about 150 ft. of approach retained fill on each side. It is 78 ft. wide with 54-ft. roadway and two 8-ft. sidewalks with intermediate strips of lawn 4 ft. wide.

Span Lengths. Economic Span Lengths for Simple-Truss Bridges on Various Types of Foundation, J. A. L. Waddell. Jl. Western Soc. Engrs., vol. 24, no. 4, Apr. 1919, pp. 215-260, 36 figs. Computations and diagrams. Conclusions are in part, that for all types of bridges economic span length increases with depth of foundation, though not in same proportion; that the lighter the superstructure and the live load it carries, the greater is the economic span length and the greater the variation of the latter with depth of foundation; that using nickel steel instead of carbon steel in the superstructure increases materially economic span length.

Stresses, Determination of. Primary Stress-Determination in Space Frames, R. V. Southwell. Eng., vol. 109, no. 2823, Feb. 6, 1920, pp. 165-168, 10 figs. Analytical method is exemplified with reference to steel cantilever bridge.

Stresses, Increasing. Increasing the Permissible Stresses for Iron Bridge Structures (Ueber die Erhöhung der zulässigen Materialinanspruchnahme eiserner Brücken), Friedrich Hartmann. Zeitschrift des oesterr. Ingenieur- u. Architekten-Vereines, vol. 71, no. 37, Sept. 12, 1919, pp. 339-341, 2 figs. Comparison of values obtained by writer with those given by Patton. Calculation of influence of method of load on the secondary stresses of chords.

Trusses, Riveted Joints in. Detail Design of Riveted Joints of Bridge Trusses, W. M. Wilson. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 259-260, 2 figs. Riveting determined by study of paths of forces connected. Two examples.

Warren Truss. Unusual Design and Joint Details of 430-Foot Bridge. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 656-657, 3 figs. Heat-treated steel eyebars and high-carbon steel built-up members used in Warren-type truss for economy in material.

[See also TRUSSES, Tregillus Type.]

BRIDGE ERECTION

Bascule Bridge, Chicago. High Gantry Used for Handling Heavy Members of Large Bascule. Eng. News-Record, vol. 84, no. 2, Jan. 8, 1920, pp. 79-80, 2 figs. Timber falsework used at 260-ft. single-leaf, double-track, Strauss bascule bridge over Chicago River for St. Charles Air Line R. R.

Kenova. Kenova Bridge Intermediate Spans. Public Works, vol. 48, no. 11, Mar. 27, 1920, pp. 237-239, 7 figs. Describes erection of two 298-ft. spans outside of old spans in service and the replacing of three remaining spans by cantilever method, using new end spans for anchorage. It is claimed that methods and plant used are suitable for consideration for replacement of long span municipal bridges.

Louisville, Ky. Louisville Bridge Erection. Contracting, vol. 9, no. 8, Dec. 15, 1919, pp. 228-229, 2 figs. Successive stages of work were operated simultaneously on sets of three 245-ft. deck spans. Old piers were remodeled and spans were replaced under traffic.

[See also BRIDGES, RAILWAY, Kenova; BRIDGES, STEEL, Rapid Erection.]

BRIDGE PIERS

Bascule-Bridge. Heavy Foundation Work for Bascule Bridge at Seattle, F. A. Rapp. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 774-776, 3 figs. Twin massive concrete blocks 65 x 40 ft. in horizontal dimensions and over 20 ft. thick constitute substructure of each of two piers. Deep pile foundations were required on one side of channel, while on other side foundation concrete rests directly upon firm material.

Pile and Concrete. Pile and Concrete Piers for Missouri River Bridge. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 824-825, 3 figs. Construction of timber pile piers carrying two 300-ft. steel truss spans of railway bridge.

BRIDGES

Approach Spans vs. Abutments. Approach Spans Compared with High Bridge Abutments, M. F. Torkelson. Eng. News-Rec., vol. 85, no. 10, Sept. 2, 1920, pp. 466-467, 2 figs. Reduction of scour and elimination of retaining walls favors approach spans. Costs in Wisconsin case.

Bascule. See BRIDGES, LIFT.

Concrete. See BRIDGES, CONCRETE.

Construction Essentials. Essentials of Good Bridge Construction Plainly Told, Chas. D. Snead. Better Roads & Streets, vol. 9, no. 11, Nov. 1919, pp. 365-368, 12 figs. Points

out that good bridges cannot be secured unless (1) adequate surveys, designs and plans, estimates and sufficient appropriation for work are made, (2) competent and reliable contractors are secured to execute work, and (3) thorough inspection of work is demanded.

Construction, Resident Engineer and. Functions and Work of the Resident Engineer on Bridge Construction, J. A. L. Waddell. Jl. Western Soc. Engrs., vol. 25, no. 4, Feb. 20, 1920, pp. 124-144, 3 figs. Notes prepared by writer for guidance of his field forces on future bridgework.

Design. See BRIDGE DESIGN.

Erection. See BRIDGE ERECTION.

Floors. See BRIDGES, HIGHWAY, Floor Joists; BRIDGES, RAILWAY, Floors for.

Highway. See BRIDGES, HIGHWAY.

Lift. See BRIDGES, LIFT.

Maintenance. The Maintenance of Bridges and Buildings, F. A. McLean. Can. Machy., vol. 22, no. 26, Dec. 25, 1919, pp. 617-619, 9 figs. Illustrates how compressed air can be used to advantage in speeding up work.

Masonry. See BRIDGES, MASONRY.

Military. See BRIDGES, MILITARY; BRIDGES, SUSPENSION, Military.

Movable. See BRIDGES, MOVABLE.

Piers. See BRIDGE PIERS.

Pontoon. See BRIDGES, PONTOON.

Railway. See BRIDGES, RAILWAY.

Span Lengths. A Review of Recent Advances in the Length of Spans of Different Classes of Bridges, Henry S. Jacoby. Cornell Civ. Engr., vol. 28, no. 2, Nov. 1919, pp. 55-61. Table giving longest spans for different classes of American bridges.

Steel. See BRIDGES, STEEL.

Stress Recorder for. The Fereday-Palmer Stress Recorder. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 138-139, 19 figs. Patented machine designed for determining stresses on bridge members.

Suspension. See BRIDGES, SUSPENSION.

Timber. See BRIDGES, WOODEN.

Unit Prices, Manitoba. Bridge Construction in Province of Manitoba. Contract Rec., vol. 34, no. 21, May 26, 1920, pp. 481-485, 10 figs. Examples of typical designs of bridges with unit prices of construction. Reinforced concrete is said to be superseding other materials.

Viaducts. See VIADUCTS.

Wood and Asphalt Flooring. New Type of Wood and Asphalt Flooring for Chicago Bridges, F. H. Avery. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 866-887, 2 figs. Transverse planks on edge form surface grooves to hold asphalt surfacing. Light weight and low cost are claimed.

Wooden. See BRIDGES, WOODEN.

BRIDGES, CONCRETE

Arch. Longest Concrete Arch Span Being Built at Minneapolis. Cement & Eng. News, vol. 32, no. 5, May 1920, p. 21, 1 fig. Arch will consist of two separate ribs of 400-ft. span between faces of piers, with rise of 88 ft. above springing line, at high-water level. Main arch is flanked at each end by one arch with clear span of 199 ft. and one of 55½ ft., total length of bridge over abutments being 1032 ft.

Through Concrete Arch Bridge to Give Large Waterway, F. W. Epps. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 994-995, 4 figs. Roadway was suspended by light hangers and each floor-beam was hinged to allow bending under arch-expansion.

See also BRIDGES, HIGHWAY, Concrete Arch.

Arch Center Trusses. Bridge Arch Center Trusses, C. D. Arthur. Public Works, vol. 48, no. 7, Feb. 28, 1920, pp. 129-132, 6 figs. Writer states that concrete barrel and rib arches for bridge spans are advantageously carried on falsework truss centers for spans of more than 25 or 30 ft., especially if very high or over spaces where obstructions are objectionable. Steel trusses are said to be more economical, safer, stiffer, more accurate and reliable, and more easily and cheaply handled, and can be rented or bought and salvaged.

Architectural Treatment. Reinforced Concrete Bridges and Their Architectural Treatment, F. G. Engholm. Concrete Age, vol. 31, no. 4, Jan. 1920, pp. 20-22. Condemns half-timber affectation in reinforced-concrete design.

Construction Plant for. Unique Plant Concretes Seven-Span Arch Bridge, Arthur Richards and Warren Carmichael. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 76-79, 6 figs. Details of central mixing plant from which concrete is hauled in hopper cars by locomotives to traveling tower, and which permits placing of concrete in 679-ft. 7-span arch bridge by direct chuting.

Design Characteristics. The Mesdoura and Oued Beth Bridges and Other Concrete Works in the Fès Region (Le pont Mesdoura, le pont de l'Oued, Beth et les ouvrages de la région de Fès), M. Galatoire-Malégarie. Annales des Ponts et Chaussées, vol. 53, no. 6, Nov.-Dec. 1919, pp. 301-405, 26 figs., partly on supp. plate. Technical study of organization of labor in arch construction and equations relative to design of concrete arch encased in foundation, together with analytical discussion of choice of characteristics for a projected design, are included.

Diagrams for Estimating Quantities. Highway Bridges of Steel and Concrete, Charles D. Snead. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 250-252, 2 figs. Diagrams showing approximate amounts of concrete in superstructures for use in estimating quantities in reinforced-concrete highway spans, and approximate amounts of steel reinforcement for estimating quantities for slab and T-beam spans with 16-foot roadway.

Girder. A Reinforced-Concrete Girder Bridge Over the Bregenzer Creek Near the Lake of Constance (Eine Eisenbetonbalkenbrücke über die Bregenzer Ache unweit des Bodensees), W. Kunze. Bauingenieur (Successor to Armierter Beton), vol. 1, no. 1, Jan. 15, 1920, pp. 19-20, 4 figs. Details of bridge 225 m. long with 1.22-m. elevated sidewalks on each side of 4.60-m. roadway, with eleven spans varying from 11 to 28 m.

Longest Concrete Girder Bridge Is Built in California. Eng. News-Rec., vol. 84, no. 9, Feb. 26, 1920, pp. 427-429, 7 figs. Bridge has two 142-ft. spans and is designed to carry one 15-ton roller or uniform load of 70 lb. per sq. ft. It is said structure proved cheaper than concrete arch or steel trusses.

Latticed-Girder. High Level Bridge at Tansley, Ont., A. W. Connor. Can. Engr., vol. 38, no. 2, Jan. 8, 1920, pp. 115-117, 10 figs. Also Contract Rec., vol. 34, no. 1, Jan. 7, 1920, pp. 4-6, 4 figs. Structure eliminates 16½ per cent grade through deep ravine. Bridge comprises five latticed-girder spans of 108-ft. each on concrete piers. Girders are placed without falsework.

Load Distribution. Investigation of the Load Distribution on the Cross Beams in a Reinforced-

BRIDGES, HIGHWAY

Concrete Girder-Bridge (Untersuchung über die Last-Verteilung von Querträgern bei einer Balkenbrücke aus Eisenbeton), F. Knorr. Armierter Beton, vol. 12, no. 12, Dec. 1919, pp. 299-308, 17 figs. Notes on calculation of load distribution, including general elasticity equations and their application; and comparison of calculation with the load test.

Memorial. Design and Construction of the Memorial Bridge at Des Moines, Iowa, K. C. Kastberg. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 91-94. Reinforced-concrete structure of open spandrel type with six arches.

Reconstruction. Renewal of Summerhill Bridge, Dublin, with Reinforced Concrete. Concrete, vol. 15, no. 7, July 1920, pp. 484-486, 3 figs. Description of reconstruction of an old bridge with reinforced concrete. Old bridge was moved half at a time, and new reinforced concrete work, consisting of pre-cast sections, was constructed in 17 hr.

Springfield, Mass. To Build Large Bridge Across the Connecticut at Springfield, C. M. Spofford. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 817-818, 2 figs. Proposed new bridge is to consist of seven reinforced-concrete arch spans with total length of 1129 ft. between abutments and clear width of roadway of 60 ft. with sidewalks 10 ft. wide on each side.

Sweden. A Swedish Concrete Bridge, Hiort Lorenzen. Concrete & Construction Eng., vol. 15, no. 9, Sept. 1920, pp. 631-634, 5 figs. Main arch of railway bridge over valley of Ore River is 93 ft. high and 307 ft. between abutments. Bridge consists of large center arch and four smaller arches, three on west and one on east bank of river.

[See also BRIDGES, HIGHWAY, Reinforced-Concrete; BRIDGES, RAILWAY, Concrete.]

BRIDGES, HIGHWAY

Batiscan River, Quebec. Batiscan Bridge Links Montreal and Quebec, F. B. Painchaud. Contract Rec., vol. 34, no. 3, Jan. 21, 1920, pp. 62-64, 3 figs. Specifications and data of projected 1211-ft. six-span steel highway structure.

Calculations. Basic Principles for the Calculation of Highway Bridges (Berechnungsgrundlagen für eiserne Strassenbrücken), H. Ellerbeck and H. Starker. Zeitschrift für Bauwesen, vol. 70, nos. 1-3, 1920, pp. 115-134, 7 figs. It is pointed out that for calculation of the stability of steel highway bridges standard load assumptions and stress limit values should be established; and that load assumptions should be established for three bridge classes, leaving a fourth class without given load regulations.

Concrete Arch. The Key Bridge Cofferdams, John T. Talman. Military Engr., vol. 12, no. 61, Jan.-Feb. 1920, pp. 45-48, 6 figs. Account of bridge in process of construction across Potomac River from Georgetown, D. C., to Rosslyn, Va., which is to be concrete arch composed of seven spans varying in length from 85 to 208 ft.; total length, including approaches, will be about 2700 ft.; width, 70 ft. 6 in., allowing for double-track electric line, two 16-ft. roadways and two 8-ft. sidewalks.

County, System for Numbering. A Comprehensive System for Numbering County Bridges, Harry F. Harris. Good Roads, vol. 19, no. 6, Feb. 11, 1920, pp. 81-82. Exposition of Dewey decimal system.

Design. See CULVERTS, Design.

Floor Joists, Load Concentrations on. Load Concentrations on Steel Floor Joists of Wood Floor Highway Bridges, T. R. Agg and C. S. Nichols. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 48, April 30, 1919, 31 pp., 24 figs. Investigation undertaken to determine manner in which heavy wheel loads, such as those of traction engines, are distributed to various I-beams and channels in highway-bridge floor system. It was found that concentration on single floor joist, equal to 55 per cent of one wheel load, is possible where single thickness of wood floor is laid on steel floor joists. Effects of loosening ends of plank, placing second layer of floor planks, etc., were also investigated.

Loads and Floors. Design of Highway Drainage Structures, Clifford Older. Public Roads, vol. 2, nos. 21-22, Jan.-Feb. 1920, pp. 17-19. Chief highway engineer of Illinois explains practices of that state with regard to highway structures and conclusions drawn. Bridge loads are limited to 16,000 lb. per axle, and bridges are built with one-course concrete floors.

Ottawa, Can. Billings Bridge Over Rideau River, Ottawa, L. McLaren Hunter. Contract Rec., vol. 33, no. 52, Dec. 24, 1919, pp. 1176-1179, 7 figs. Steel bridge carrying two electric car tracks, two 15-ft. roadways, and two 6-ft. cantilever sidewalks.

Reinforced-Concrete. Reinforced Concrete Highway Bridges. Public Works, vol. 48, no. 19, May 22, 1920, pp. 442-444. Details of design, specifications and construction which should be studied with view to developing and standardizing practice in this branch of highway work, as proposed by chairman of committee of Am. Concrete Inst.

Rhine River. The Second Stationary Highway Bridge Over the Rhine River at Cologne (Die zweite feste Strassenbrücke über dne Rhein in Köln), W. Dietz. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 32, 33 and 34, Aug. 7, 14 and 21, 1920, pp. 613-618, 645-651 and 667-672, 83 figs., 41 on 4 supp. plates. Review of specifications governing competitive bids. Notes on foundation work of the water and land piers under compressed air by means of reinforced-concrete caissons; spanning the streets on either side of river banks with three-hinged arch of reinforced concrete. Tied-back suspension bridge with balanced horizontal tie. High-grade nickel steel was used for chain, stiffening girders and cross-girders. Static effect of the entire supporting system. Calls attention to low deflection, short construction period and low construction costs.

Steel vs. Wood. Highway Bridges and Culverts, M. A. Lyons. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 88-89. Discussion of comparative costs of timber, steel and concrete bridges, design and construction of bridges and culverts.

Strengthening. See BRIDGES, STEEL, Reconstruction.

Stringers. Load Distribution Over Stringers of Highway Bridges. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1209-1210, 3 figs. Iowa tests on 3-in. plank floors are said to indicate that stringer load is only about one-half of wheel concentration.

Types and Costs. Justifiable Types and Costs of Bridges, M. A. Lyons. Contract Rec., vol. 34, no. 24, June 16, 1920, pp. 581-584. See also Can. Engr., vol. 38, no. 25, June 17, 1920, pp. 578-580. Amount of justifiable expenditure due to saving effected by an increase in weight of load which can be hauled by construction of bridge will vary, it is said, as the traffic, and when amount of traffic is known the economical expenditure can be ascertained. Various methods of determining area of waterway required are pointed out. Paper read before Can. Good Roads.

Widening. Widening of Road Bridges. Surveyor, vol. 57, no. 1461, Jan. 16, 1920, p. 35, 4 figs.

Details of reinforced-concrete cantilever footpaths.

Widths and Loadings. Widths and Loadings for Highway Bridges, Lewis M. Gram. Municipal & County Engr., vol. 58, no. 5, May 1920, pp. 204-206. Important elements in bridge problem are said to be type of structure, material best adapted, and capacity both as to volume of traffic which may be accommodated at one time and as to its weight. Notes on concentrated loads, impact, etc. Paper presented at 6th annual short course in highway engineering at University of Michigan.

BRIDGES, LIFT

Bascule. Adjusting a Highway Bridge to Its Site. Can. Engr., vol. 39, no. 4, July 22, 1920, pp. 169-171, 5 figs. Bridge over Lunn River at Port Dover, Ont., arranged to suit crossing conditions: symmetrical layout; counterweight of bascule span masked; hand rail of latticed steel to give continuous effect; and foundations on rock.

Gas Pocket Causes Trouble in Pneumatic Foundation, J. E. Bebb and L. B. Alexander. Ry. Age, vol. 69, no. 12, Sept. 17, 1920, pp. 475-477, 7 figs. Strauss single leaf bascule bridge of 125 ft. clear span with square crossing built by Michigan Central Railway over River Rouge at Detroit, Mich.

Bascule, Chicago. Chicago Bascule Bridge—Design and Operating Features, Hugh E. Young. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 508-514. 10 figs. Four-truss duplex construction of double-deck bridge. Emergency grip brakes. Interlocked control of gates, locks, safety devices and machinery.

Longest Single-Leaf Bascule Bridge: Chicago River. Eng. News-Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1056-1060, 12 figs. Double-track, 260-foot span with unusually large trunnions, cantilever tower, pneumatic buffers and emergency brake. Plan to move bridge to new site.

World's Longest Bascule Span Erected at Chicago. Ry. Age, vol. 67, no. 24, Dec. 12, 1919, pp. 1133-1137, 10 figs. Structure contains single-leaf span 260 ft. long.

Bascule, Rolling Type. Advantages of Rolling Bascule Bridges, Walter P. Chapman. Contract Rec., vol. 34, no. 14, April 7, 1920, pp. 316-318, 6 figs. It is noted that rolling lift provides maximum lever arm and therefore permits use of more economical material for counterweight. It is stated that 300 bridges of this type are now in operation.

Bascule, San Francisco. An Electrically Operated Bridge in San Francisco. Elec. Rev. (Chicago), vol. 75, no. 23, Dec. 6, 1919, pp. 933-934, 2 figs. Bridge is of single-leaf construction with span of 94 ft.

Bascule, Seattle, Wash. Three Double-Leaf Bascule Bridges at Seattle, Wash., F. A. Rapp. Eng. News-Rec., vol. 84, no. 15, April 8, 1920, pp. 718-722, 6 figs. Bridges are two-leaf structures of simple trunnion type and have live-load bearing near river edge of each trunnion pier, 13 ft. in front of trunnion. In closed position each leaf pivots on this bearing instead of on trunnion, so that counterweight acts with longer lever arm than it does in open position of bridge and uplift at tail of leaf is decreased.

Bascule, Welland River. Steel Bascule Bridge Over Welland River. Contract Rec., vol. 34, no. 2, Jan. 14, 1920, pp. 30-31, 5 figs. Bridge will consist of 100-ft. steel bascule span and two fixed 75-ft. steel approach piers and abutments.

Strauss Bascule. Bascule Bridge, Largest of Its Type, W. T. Christine. Eng. World, vol. 16, no. 1, Jan. 1, 1920, pp. 11-14, 3 figs. Details of Strauss heel trunnion type of bascule bridge over Chicago River.

The New 260 Ft. Span Single Leaf Bascule Bridge of the Illinois Central R. R. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 717-719, 4 figs. Bridge is of Strauss heel trunnion type.

[See also BRIDGES, RAILWAY, Lift-Span.]

BRIDGES, MASONRY

Morocco. Masonry Bridges at Morocco (Construction de ponts en maçonnerie, au Maroc), Génie Civil, vol. 76, no. 17, Apr. 24, 1920, pp. 385-390, 10 figs. Structural details of types built after Séjourné design over the Petrusse at Luxemburg. They consist of two or three parallel arches carrying flag-stone pavement. From Annales des Ponts et Chaussées.

BRIDGES, MILITARY

A. E. F. Types. Bridge Engineering in Active Warfare, Lewis E. Moore and Marshall W. McDonald. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 734-741, 21 figs. Civilian bridge design methods applied in work of American Expeditionary Forces; types of bridge developed.

Curlian Design Methods. Bridge Engineering in Active Warfare, Lewis E. Moore and Marshall W. McDonald. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, pp. 688-696, 26 figs. Curlian bridge-design methods applied in work of Am. Expeditionary Forces.

Design. Design of Straight Continuous Bridges Resting on Fixed or Elastic Supports (Le calcul des poutres droites continues sur appuis fixes ou élastiques), Léon Descans. Annales des Travaux Publics de Belgique, vol. 20, no. 5, Nov. 1919, pp. 635-703, 56 figs. partly on 5 supp. plates. Numerical applications of theory developed in previous installments.

Portable. Portable Military Bridges, C. E. Inglis. Engr., vol. 128, no. 3326, Sept. 26, 1919, pp. 310-312, 11 figs. Evolution of type which became in later stages of war standard bridge for rapid advance work. Paper read before British Assn. for advancement of Science. Also in Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1044-1049, 6 figs.

Pre-Assembled. Pre-Assembled War Bridges (Vorbereitete Kriegsbrücken), F. Bethke. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, nos. 11-12, June 15, 1920, pp. 117-119, 9 figs. Describes the Lübbecke type used frequently during war, standard component of which is the 2-m. Z-bar which can be handled by one man. Members are connected at joints with link bolts.

[See also TRESTLES, Construction.]

BRIDGES, MOVABLE

Dock. Pontoon Drawbridge and Temporary Girder Swingspan. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 271-272, 3 figs. Bobtail swingspan built of old girders and operated by cable gear. Replaced by timber pontoon span.

Navigation Signals for. Navigation Signals for Drawbridges, Paul C. Butte. Pacific Mar. Rev., vol. 17, no. 6, June 1920, pp. 92-94, 4 figs. Explains fundamental principles of operation of different types of draws now used, namely, horizontal swing drawbridges, bascule drawbridges, and vertical lift drawbridges, and electric light signals for each type.

Railway, Sweden. International Contest for Designs for a Railroad Bridge Over Arsta Bay Near Stockholm (Der zwischenstaatliche Wettbewerb für Entwürfe zu einer Eisenbahnbrücke über die Arstabucht bei Stockholm), H.

Schaper. Bauingenieur (successor to Armierter Beton), vol. 1, no. 1, Jan. 15, 1920, pp. 3-9, 15 figs. Plans call for a movable bridge, 600 m. long, opening to a width of 24 m. for passage of high-masted ships, with superstructure of iron or concrete, or both. Details and illustrations of the three prize-winning designs and of the four designs bought by the railroad administration are given. See also article by H. Kayser, Zentrallblatt der Bauverwaltung, vol. 40, nos. 9, 11 and 12, Jan. 31, Feb. 7 and 11, 1920, pp. 53-56, 65-69 and 73-76, 34 figs.

Stockholm, Sweden. International Competitive Designs for a Railroad Bridge Over Arsta Bay Near Stockholm (Wettbewerb zu einer Eisenbahnbrücke über die Arsta-Bucht bei Stockholm), Zentralblatt der Bauverwaltung, vol. 40, nos. 20, 21 and 32, Mar. 10, 13 and Apr. 21, 1920, pp. 125-127, 130-136, 35 figs., and 193-200, 32 figs. Plans call for movable bridge 600 m. long, opening to width of 24 m. for passage of high-masted ships, with superstructure of iron or concrete, or both. Details and illustrations of three prize-winning designs and four designs bought by railroad administration.

[See also BRIDGES, LIFT; BRIDGES, SWING; DRAWBRIDGES.]

BRIDGES, PONTOON

German-Equipment. Bridging the Rhine with German Pontoon Equipage, S. C. Godfrey. Prof. Memoirs, Corps of Engrs., U. S. Army & Engr. Dept. at Large, vol. 11, no. 59, Sept.-Oct. 1919, pp. 571-580, 5 figs. German equipment is provided with steel boats. Each wagon carries eight balk and twenty chesses underneath overturned boat. Organization details of divisional bridging train are also given.

BRIDGES, RAILWAY

Arch, Hell Gate. Hell Gate Bridge, New York, Frank W. Skinner. Engineering, vol. 108, nos. 2804, 2807 and 2812, Sept. 26, Oct. 17 and Nov. 21, 1919, pp. 412 and 416-418, 6 figs., 499-504, 20 figs. partly on 2 supp. plates, and 674-678, 28 figs. partly on 3 supp. plates. Sept. 26: Specifications for rivets; yard assembling of trusses; Oct. 17: Erection of backstay systems and arch trusses; Nov. 21: Design of viaducts.

Arch, Niagara. See Niagara Arch Bridge.

Baltimore and Ohio. Baltimore & Ohio Builds New Main Line Bridge, H. A. Lane. Ry. Age, vol. 68, no. 22, May 28, 1920, pp. 1504-1506. Replacement of Allegheny River crossing at Pittsburgh, Pa., necessitated by traffic conditions. Improvement involved truss and girder spans over total length of 2122 ft. across river to an abutment forming end of new structure.

Canada. Kettle Rapids Bridge, W. Chase Thomson. Trans. Eng. Inst. of Canada, vol. 32, part 2, Jan. to June 1918, pp. 391-414, 17 figs. partly on 5 supp. plates. Continuous structure 1000 ft. long, having channel-span of 400 ft. and two side-spans of 300 ft. each. Trusses are of sub-divided Warren type, 50 ft. deep throughout, 24 ft. apart centre to centre, having 25-ft. panels.

Concrete. The Butin Bridge Over the Rhône near Geneva (Le pont Butin sur le Rhône près Genève), M. Brémond. Bulletin technique de la Suisse romande, vol. 46, no. 14, July 10, 1920, pp. 157-161, 7 figs. partly on supp. plate. Reinforced-concrete structure.

Construction. Methods of Constructing Substructure of Thames River Railroad Bridge, New London, Conn., James W. Rollins. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 85-88, 5 figs. Bridge is 1387 ft. long, total weight of load on superstructure is estimated at 5175 tons, and the total cost of erection per ton was $162.

Floors for. Floor for Railway Under-Bridges. Engr., vol. 129, nos. 3355 and 3356, April 16 and 23, 1920, pp. 391-394, 11 figs., and 416-418, 8 figs. Following types are described: single line, double line, and double line with centre girder, longitudinal and concrete.

Kenova. Kenova Bridge Channel Span Erection. Public Works, vol. 48, no. 19, May 22, 1920, pp. 437-439, 4 figs. Cantilever erection of 518-ft. center span outside of old span under traffic. Adjacent anchor spans moved longitudinally and heavy girder ties shortened for erection adjustments. Center panel erection connections adjusted by jacking up ends of connected spans.

Lift-Span. Novel Falsework Method Used on New Haven Bridge. Ry. Age, vol. 69, no. 11, Sept. 10, 1920, pp. 433-438, 11 figs. Bridge had to be erected in such a manner as to maintain an open channel at all times and to permit opening and closing of old draw span.

Missouri River. An Unusual Design for a Missouri River Bridge. Ry. Age, vol. 67, no. 25, Dec. 19, 1919, pp. 1177-1179, 5 figs. Pile piers are used as supports for 300-foot steel truss span.

Niagara. Niagara Railway Arch Reinforced for Heaviest Traffic. Eng. News-Record, vol. 83, no. 19, Nov. 13-20, 1919, pp. 877-881, 4 figs. Stresses in 550-ft. arch span were redistributed by changing crown shims. Floor was reconstructed for E 70 loading.

Revision of The Niagara Railway Arch Bridge, Charles Evan Fowler. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 5, May 1920, pp. 711-791, 23 figs. Revision comprised investigation of live loads for railway bridges in order to determine probable maximum loading for such bridge, which is double-track, two-hinged, 550-ft. arch. Series of strain-gage readings, methods of which are fully described, was made. Dead-load stresses were investigated by jacking apart one top chord of arch span by means of special toggle, center top chord dead-load stress being read with strain gage. New Fuller-West strain gage, developed as result of investigations, is described.

Steel-Plate Drip Floor for Niagara Railway Arch Bridge. Can. Ry. & Mar. World, no. 262, Dec. 1919, pp. 645-646, 3 figs. Floor consists of plates of copper-steel 3/16 in. thick resting on maple raising strips bolted to top flanges every 3 ft. by countersunk bolts.

Ohio River. The Metropolis Bridge Over the Ohio River at Metropolis, Ill., Ralph Modjeski. Jl. Western Soc. Engrs., vol. 24, no. 2, Feb. 1919, pp. 59-81 and (discussion) pp. 81-87, 36 figs., partly on fourteen supp. plates. Main bridge consists of one 300-ft. through span, four 551-ft. 3-in. through spans, one 720-ft. through span, and one 246-ft. deck span. General problems of design and construction are discussed.

Platte River. Platte River Bridge Reconstruction, Rock Island Lines. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 287-289, 5 figs. Pile-bent piers with concrete caps to carry girder-spans, and sheathed pile bents fitted with pile breakers, are prominent features of design.

Raising and Repairing. The Raising and Repair of the Railway Bridge at Houplines, E. M. Sinauer. Bul. Int. Ry. Assn., vol. 1, no. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 238-244, 2 figs. Bridge consisted of single span, 125 ft. clear, total weight being about 100 tons.

Rapid Construction. Southern Railway Rebuilds Chattanooga Bridge. Ry. Age, vol. 68, no. 15, Apr. 9, 1920, pp. 1141-1143, 6 figs. Account

of project in rapid emergency bridge construction recently completed by Southern Railway at Chattanooga, Tenn., telling how work on foundations and superstructure was handled.

Reconstruction. Extending the Life of the Niagara Gorge Arch. Ry. Age, vol. 68, no. 20, May 14, 1920, pp. 1393-1397, 8 figs. Overhauling of Grand Trunk Railway Bridge to carry loads 62 per cent greater than those for which it was designed 22 years ago.

Kenova Bridge End Span Erection. Public Works, vol. 48, no. 15, April 24, 1920, pp. 345-347, 2 figs. Two single-track 298-ft. spans, 100 ft. above water level, were replaced by double-track spans on substructure without interrupting traffic.

Reconstruction in Wartime. Reconstruction of Destroyed Railroad Bridges in Occupied Territory During the War (Der Wiederaufbau Zerstörter Eisenbahnbrücken in Feindesland durch die Brückenbauabteilung der Gutehoffnungshütte in Sterkrade), F. Bohny. Der Eisenbau, vol. 10, no. 10, Oct. 1919, pp. 207-222, 29 figs. Details of design and reconstruction of numerous bridges in Belgium, France and Russia.

Reinforcing Pins of Truss Span. Reinforcing the Pins of a Truss Span. Ry. Maintenance Engr., vol. 16, no. 2, Feb. 1920, pp. 57-58, 2 figs. Illustrates how hip pins of truss span were reinforced by obtaining better distribution of load on pins. Structure was 153-ft. 8-in. through truss bridge over Skunk River at Hayesville, Ia., on C., M. & St. P. R. R.

Steel, Design. Report on Iron and Steel Structures. Ry. Age (Daily Edition), vol. 68, no. 11c, Mar. 18, 1920, pp. 911-915, 3 figs. Curve comparing column formulæ is given and a formula is recommended for use with ordinary structural steel for which basic unit tensile stress is 16,000 lb. per sq. in. and for ratios of l/r not greater than 200. Also specification loading for design of steel railroad bridges. Committee report presented to Am. Ry. Eng. Assn.

Steel, Specifications for. Report of Committee XV—On Iron and Steel Structures. Bul. Am. Ry. Eng. Assn., vol. 21, no. 223, Jan. 1920, pp. 429-520, 46 figs. General specifications for steel railway bridge, and comparison of column formulæ.

Thames River. Thames River Bridge, James W. Rollins. Boston Soc. Civil Engrs. Jl., vol. 7, no. 6, June 1920, pp. 177-199, 17 figs. Description of difficulties encountered in construction of bridge, which is 1378 ft. in length, made in five spans, has a total weight of the load on superstructure of 5175 tons, and was erected at a total cost of $162 per ton.

Wooden. Report of Committee VII—On Wooden Bridges and Trestles. Bul. Am. Ry. Eng. Assn., vol. 21, no. 225, March 1920, pp. 303-362. Also in Ry. Age (Daily Edition), vol. 68, no. 11c, Mar. 18, 1920, pp. 915-917. Specifications and classification and grading rules for lumber and timber to be used in construction and maintenance of Way Department of railroads.

[See also BRIDGES, LIFT, Bascule, Rolling Type; BRIDGES, MOVABLE, Railway, Sweden.]

BRIDGES, STEEL

Alloy Steels for. Economical Use of Alloy Steel for Bridge Construction (De l'emploi économique des alliages d'acier dans la construction des ponts), J.-A.-L. Waddell. Comptes rendus de Séances de l'Académie des Sciences, vol. 171, no. 2, July 12, 1920, pp. 80-83. It is prescribed that if R is ratio of prices per unit of two steels considered, and R inverse ratio of their elastic limits, then it is economical to use the higher priced when RR^1 is less than 1. Examples are worked out.

Anchor Pins, Renewal of. Anchor Pins of Cornwall Cantilever Bridge Bored Out and Renewed, H. T. Welty. Eng. News-Rec., vol. 84, no. 10, March 4, 1920, pp. 453-456, 8 figs. Repair work of steel bridge involved boring out of worn and weak pins and replacing them with new pins of larger diameter. It is said work was accomplished without use of supporting falsework under bridge and with practically no interruption to traffic.

Design. Stability of Compression Members of Steel Bridges (La stabilité des membrures comprimées des ponts métalliques), M. Keelhoff. Annales des Ponts et Chaussées, vol. 55, no. 2, March-April 1920, pp. 193-231, 27 figs., partly on supp. plate. Suggestions in regard to design of cross bracings. Cases in which they are indispensable.

See also BRIDGE DESIGN.

Highway. See BRIDGES, HIGHWAY, Ottawa, Can.

Ottawa, Canada. Billings Bridge Over Rideau River, Ottawa, L. McLaren Hunter. Contract Rec., vol. 33, no. 52, Dec. 24, 1919, pp. 1176-1179, 7 figs. Steel bridge carrying two electric car tracks, two 15-foot roadways and two 6-foot cantilever sidewalks.

Rapid Erection. The First Bridge to be Constructed on the Roth Waagner System (Die erstmalige Anwendung der Roth-Waagner-Brücke), R. Feindler. Eisenbau, vol. 11, no. 8, Apr. 23, 1920, pp. 151-156, 8 figs. Details of 470-m. steel truss bridge over Save River, Belgrade, Servia, built according to system developed by Roth & Waagner, Vienna-Budapest, which permits of extremely rapid erection.

Reconstruction. Reconstructing East Main Street Bridge, Rochester. Public Works, vol. 49, no. 2, July 10, 1920, pp. 23-27, 2 figs. Describes how wide, short-span city bridge over railroad tracks was reconstructed without interrupting traffic. New trusses were temporarily supported by old ones and vice versa. Steel was unloaded and erected by stiff-leg derricks on abutments.

Reconstructing Poughkeepsie Cantilever Bridge for Heavy Traffic, Clement E. Chase. Eng. News-Rec., vol. 84, no. 11, March 11, 1920, pp. 528-534, 11 figs. Double-track deck over three trusses changed to gauntlet-track deck. Structure is 6767 ft. long over all. Main spans over Hudson constitute cantilever system with two fixed spans 525 ft. long, three cantilever spans 546 and 548 ft. long, and two anchor arms 200 ft. 10 in. long.

Strengthening a County Bridge to Carry Motor-Truck Traffic, Morris Goodkind. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 617-618, 3 figs. Replacement of stringers and reinforcements of floor beams in 52-ft. span steel bridge.

The Reconstruction of the Bridge over the Narew River Near Modlin (Nowo Georgiewsk), Poland (Die Wiederherstellung der Brücke über den Narew bei Modlin). Eisenbau, vol. 11, no. 9, May 4, 1920, pp. 161-185, 36 figs. Three new large superstructures were built in place of old ones with same span of 76.86 m., according to system of parallel beam with alternating rising and falling diagonals and intermediate verticals; height of system, 7.15 m.; bay width, 7.32 m.; width of roadway, 5 m. with 1.78-m. sidewalks on either side; weight of steel construction, over 2000 tons. Details of equipment used.

Restoration. Restoration of the Cernavoda-Danube Bridge. Eng., vol. 109, no. 2842, June 18, 1920, pp. 837-840, 19 figs. Restoration by

Germans of bridge and viaduct destroyed by Rumanians and Russians.

Solid-Web Trusses. The Calculation of the Statically Indeterminate Solid Web Trusses with the Aid of Displacement Diagrams (Zur Berechnung statisch unbestimmter Vollwandbinder mit Hilfe von Verschiebungsplänen), E. Kammer. Eisenbau, vol. 11, no. 5, Mar. 9, 1920, pp. 117-128, 31 figs. Calculation of displacements in bar tensions by determination of vertical and horizontal components. Investigation of frequently occurring special conditions whereby area of influence for statically indeterminate quantity of system is a parabola. Formulæ for calculation of horizontal components of displacements given for the case where the equation of the truss of header axis and equation of vertical displacements are known.

Stresses in. Increase of Permissible Material Stresses in Steel Bridges (Ueber die Erhöhung der zulässigen Materialinanspruchnahme eiserne Brücken), Friedrich Hartmann. Zeitschrift des Oesterreichische Ingenieur- u. Architekten-Vereins, vol. 71, no. 41, Oct. 10, 1919, pp. 371-374, 4 figs. Examples are cited of secondary stresses in struts.

Testing. New Regulations of the French Ministry of Public Works for the Calculation and Testing of Metallic Bridges. Bul. Int. Ry. Assn., vol. 2, no. 7, July 1920, pp. 434-458, 6 figs. Regulations are applicable to (1) underbridges carrying normal-gage lines of rails, (2) underbridges carrying meter-gage lines of rails, (3) overbridges carrying roads, and (4) canal bridges. Translated from Annales des Ponts et Chaussées.

Trusses. Comparative Economics of Continuous and Non-Continuous Trusses, J. A. L. Waddell and H. Malcolm Priest. Proc. Engrs.' Soc. West. Pa., vol. 36, no. 6, July 1920, pp. 409-417, 4 figs. It is concluded from results of investigation that for long spans the divided-triangular trussing is decidedly superior to the Petit trussing for bridges with continuous-truss spans, but not so much so for those of simple-truss spans; for long spans there is an important saving of metal by adopting continuous trusses, and it is nearly twice as great for standard highway as for modern, double-track railway bridges; in no case should either the Pratt or Petit truss be employed for continuous spans, because in these the divided-triangular truss is more economical.

[See also BRIDGES, HIGHWAY, Batiscan River; Calculations; BRIDGES, LIFT; BRIDGES, RAILWAY, Arch; B. & O.; Kenova; Missouri River; Niagara; Ohio River; Platte River; Steel, Design.]

BRIDGES, SUSPENSION

Cables, Deflection. See CABLES, Deflections, Computation of.

Columbia River. Columbia River Suspension Bridge, W. A. Scott. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 23-25, 6 figs. Bridge has span of 632 ft. between two reinforced concrete towers. Suspended structure is supported by four 2½-in. galvanized steel cables extending over towers and anchored in concrete blocks.

Deflection, Reduction of. The Suspension Bridge over the Rio Sapucahy (Brazil) and General Considerations of Suspension Bridge Deflections (Die Hängebrücke über den Rio Sapucahy nebst einigen allgemeinen Bemerkungen über die Durchbiegung von Hängebrücken), A. Müllenhoff. Eisenbau, vol. 11, no. 6, Mar. 23, 1920, pp. 129-137, 9 figs. Account of a statically indeterminate steel cable bridge of 90 m. span with 4.24 m. distance between main girders which are 2.19 m. high. Numerical tables are given for use of designing engineers, as well as general formulæ relating to reduction of deflection.

Military. A 370-Foot Military Suspension Bridge, W. F. Davidson. Michigan Technic, vol. 33, no. 1, March 1920, pp. 15-22, 6 figs. Details of bridge built across Scioto River at Camp Sherman under direction of 1st Battalion, 308th Engineers, 83rd Division.

New York-New Jersey. The Proposed Victory Bridge Over the Hudson Between New York City and Weehawken, Robert Imlay. Architectural Rec., vol. 48, no. 3, Sept. 1920, pp. 219-223, 4 figs. Suggested design.

Wind Load. Calculation of Extent to Which Cable in Suspension Bridges Takes Up Wind Load (Die Entlastung des Windverbandes bei Hängebrücken durch die Kabel), N. Royen. Der Eisenbau, vol. 10, no. 11, Nov. 1919, pp. 239-243, 3 figs. Writer gives what he describes as a simple and exact method for this calculation.

Wire vs. Eyebar Cables. Comparative Economics of Wire Cables and High-Alloy-Steel Eye-Bar Cables for Long-Span Suspension Bridges, J. A. L. Waddell. Proc. Engrs.' Soc. West. Pa., vol. 36, no. 6, July 1920, pp. 418-436 and (discussion) pp. 437-453, 5 figs. It is concluded that neither untreated Mayari-steel eyebars nor heat-treated carbon-steel eye-bars can compete with wire in the building of highway suspension bridges; if Mayari-steel eye-bars, after being heat-treated, are reliable and satisfactory, they can probably compete with wire cables for spans up to 2000 ft.; untreated eyebars of high-grade, nickel steel are more economical than wire for spans up to 1400 ft.; heat-treated eye-bars of high-grade nickel steel are probably economic for all spans less than 3000 ft.

[See also BRIDGE DESIGN, Cantilever vs. Suspension.]

BRIDGES, SWING

Repairing. A Novel Method of Repairing a Swing Bridge, Herbert C. Meith. Proc. Am. Soc. Civil Engrs., vol. 46, no. 2, Feb. 1920, pp. 305-331, 11 figs. partly on 2 supp. plates. Method used to renew chords of swing span of Washington Bridge over Housatonic River without impeding traffic. System of temporary adjustable timber members was devised to carry bottom-chord stresses while permanent chords were being renewed, allowing free use of bridge for half width of roadway at all times and also permitting span to be opened as required for river traffic.

BRIDGES, TIMBER

See BRIDGES, WOODEN.

BRIDGES, WOODEN

Renewal. Report on Methods and Equipment Used in Renewing Timber Bridges in Whole and in Part. Ry. Maintenance Engr., vol. 15, no. 11, Nov. 1919, pp. 398-399, 1 fig. Résumé of present practice. Committee report presented at Convention of Am. Ry. Bridge & Building Assn. Also in Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 642-644.

Repairing. Methods of Repairing Timber Bridges. Contract Rec., vol. 34, no. 1, Jan. 7, 1920, pp. 16-17, 1 fig. Practice of railways in replacing pile bents and renewing timbers, stringers and ties.

Timber Bridge Repairs in British Columbia, T. Kilpatric. Contract Rec., vol. 34, no. 22, June 2, 1920, pp. 496-498, 4 figs. Methods of strengthening old truss structures. Paper read before Provincial District Engrs.

[See also BRIDGES, HIGHWAY; BRIDGES, RAILWAY, Wooden; TRESTLES.]

BRINELL HARDNESS

See HARDNESS, Testing.

BRINELL HARDNESS TESTING MACHINES

See TESTING MACHINES, Brinell Hardness-Testing.

BRIQUETTING

Flue-Dust. See BLAST FURNACES, Flue-Dust Briquetting.

Lignite. See LIGNITE, Briquetting.

[See also MATERIALS, Granular, Compression of.]

BRITANNIA METAL

Metallurgy of. Some Notes on the Constitution and Metallurgy of Britannia Metal, F. C. Thompson and F. Orme. Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 276-278, 7 figs. Heat treatment, Brinell impressions and etchings showing structure of tin alloys with small quantities of antimony and copper known as Britannia metal.

BRITISH ENGINEERING STANDARDS ASSOCIATION

See SCREW THREADS, British Association.

BROACHES

Design of. Graphical Method of Designing Broaches. Machy. (Lond.), vol. 16, no. 401, June 3, 1920, pp. 265-266, 4 figs. Description and illustrations of graphical method of determining diameter or size of any tooth or a broach after total amount of stock to be removed has been determined.

Tooth Sizes. Graphical Method of Designing Broaches, George C. Hanneman. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 823-824, 5 figs. Method for determining diameter or size of any tooth of a broach after total amount of stock to be removed has been determined.

BROACHING

Machines. A New Broaching Machine. Engr., vol. 129, no. 3361, May 28, 1920, pp. 558-559, 2 figs. on p. 554. Describes machine constructed by Vickers, Ltd., in which it is claimed, an exceedingly quick return of screw is obtained, being brought about by provision of independent drives for the cutting and return strokes of screw.

Broaching as an Aid to Greater Production, Frank H. Mayo. Can. Machy., vol. 22, nos. 22 and 24, Nov. 27 and Dec. 11, 1919, pp. 519-572, 29 figs. Combinations used in production of broaching work, together with description of various types of broaching machines.

Practice. Modern Broaching Practice, Edward K. Hammond. Machy. (N. Y.), vol. 26, nos. 10 and 11, June and July 1920, pp. 903-909, 1049-1052, 20 figs. Also in Machy. (Lond.), vol. 16, nos. 405-406, July 1 and 8, 1920, pp. 381-387 and 413-416, 20 figs. Broaching can be employed for finishing outside surfaces of work as well as various shaped openings. Methods used are described and also broaching fixtures.

Set-Ups for. Broaching as an Aid to Greater Production, Frank H. Mayoh. Can. Machy., vol. 23, no. 2, Jan. 8, 1920, pp. 37-39, 12 figs. Examples of set-ups.

BROACHING PRESSES

Metalwood. Metalwood Tappet Guide-Hole Broaching Press. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 851-852, 4 figs. Type of hydropneumatic press designed for finishing motor tappet guide holes. Built by Metalwood Manufacturing Co., Detroit.

BRONZE

Electrodeposition of. See ELECTROPLATING, Bronze, Deposition of.

[See also BRASS; BRONZES; NON-FERROUS METALS.]

BRONZE CASTINGS

Elastic Properties. Elastic Properties of Bronze Castings, George F. Comstock. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1113-1118, 4 figs. Tests are quoted in which definite proportional limit was easily determined for bronzes, and suggestion is made that this test should replace "yield point" determinations.

BRONZES

Aluminum. See ALUMINUM ALLOYS, Bronzes.

Cadmium, Effect of Adding. Influence of Cadmium on the Properties of Bronzes (Influence du cadmium sur les propriétés des laitons), Leon Guillet. Revue de Métallurgie, vol. 16, no. 6, Nov.-Dec. 1919, pp. 405-415, 15 figs. It is concluded that one per cent cadmium in bronzes containing from 60 to 70 per cent copper may be added without producing modifications in mechanical properties. Influence of cadmium is manifested by degree of resilience and with larger amounts of cadmium ductility decreases and structure assumes spherical agglomerations of free cadmium.

High-Resistance. High-Resistance Bronzes (Bronzes à haute résistance). Fonderie Moderne, vol. 12, no. 5, May 1919, pp. 113-116, 1 fig. Suggestions in regard to drying molds, utilizing waste and soldering. From Bulletin Technologique des Arts et Métiers.

Manganese. Behavior of Wrought Manganese Bronze Exposed to Corrosion While Under Tensile Stress, P. D. Merica and R. W. Woodward, Dept. Commerce, Technologic Papers of Bur. of Standards, no. 135, Oct. 16, 1919, 9 pp., 3 figs. Within period of exposure of two years no specimen of wrought manganese bronze is said to have fractured under stress below its proportional limit.

Metallurgy of Manganese Bronze, Ernest J. Davis. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 109-111, 4 figs. Photomicrographs indicating percentage of alpha and beta solid solutions.

Phosphor Bronze. The Testing of Phosphor Bronze, Leslie Aitchison. Metal Industry (London), vol. 15, no. 26, Dec. 26, 1919, pp. 525-526. Opinion is expressed that Brinell test or scleroscope test should be disregarded for cast phosphor bronze and that metal should be passed upon tensile test.

Phosphorus, Effects of. The Effect of Phosphorus on Bronze, William Owens. Metal Indus., vol. 15, Oct. 10, 1919, p. 293. Philip's specification that for bearings limiting values of copper and phosphorus be made 84.5 to 91 per cent. and 0.37 to 0.85 per cent., respectively, is recommended.

Specifications. See BRASSES, Specifications.

Standardization. See BRASS, Standardization of.

White Navy Composition. White Navy Bronze. Mar. Engr. & Naval Architect, vol. 42, no. 7, Feb. 1920, pp. 195-197, 2 figs. Notes on its composition and microstructure.

Zinc. Five Foundry Tests of Zinc Bronzes, C. P. Karr. Brass World, vol. 15, no. 10, Oct. 1919, pp. 320-322. Proportional limit, tensile strength, elongation and reduction in area of specimens of two compositions, 88 copper, 10

tin, and 2 zinc, and 88 copper, 8 tin, and 4 zinc.

[See also BRONZE; NON-FERROUS METALS, Flux Skimming.]

BRUSHES

Carbon. Carbon Brush Testing, John S. Dean. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 369-372, 6 figs. Also in Elec. Ry. Jl., vol. 56, no. 8, Aug. 21, 1920, pp. 363-367, 10 figs. Several materials which enter into composition of carbon brushes are discussed, together with methods used for testing strength, harness, accuracy of dimensions and specific resistance.

See also ELECTRICAL MACHINERY, Brushes, Carbon.

Connections to Holders. Connections Between Brushes and Brush-Holders, Warren C. Kalb. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 365-367, 21 figs. Methods of connecting shunts to brushes and their relative merits.

BRUSH HOLDERS

Design. Defects to be Avoided on Yoke Supported Brush Holders, J. A. Horton. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 772-775, 18 figs. Defects and errors are illustrated by diagrams and it is suggested that when manufacturing wooden brush-yokes work should be done to correct drawings.

BUCKET ELEVATORS

Belting for. Good Practice in the Operation of Elevator Belting. Belting & Transmission, vol. 16, no. 12, June 20, 1920, pp. 29-30. Includes table showing capacity of an elevator in cu. ft. per hr., traveling at rate of 100 ft. per min. with buckets spaced 12 in. apart. Bucket elevators which have large buckets liberally spaced on broad belt are said to give most general satisfaction in practice; elevator should be designed to carry maximum feed that it may be called upon to handle for short time; good practice calls for belt 2 in. wider than length of buckets. Recommendations of the B. F. Goodrich Rubber Co.'s engineers.

Design. Design and Calculation of Bucket Elevators (Bauart und Berechnung der Schaukelbecherwerke), A. Peter. Der praktische Maschinen-Konstrukteur, vol. 53, no. 19-20, May 13, 1920, pp. 145-172, 52 figs. Notes on the development of bucket elevators with details of their separate parts and general arrangement; calculation of the resistances of the separate parts, and the power of motor required; advantages and disadvantages from economic standpoint. Bibliography.

Gravity Discharge Type. Types and Uses of Bucket Elevators, Clarence C. Brinley. Coal Trade Jl., vol. 51, no. 2, Jan. 14, 1920, pp. 52-54, 12 figs. Outline of various arrangements of gravity discharge elevators.

Portable. See COAL HANDLING, Portable Bucket Elevator.

Speed Compensated. Bucket Chains with Speed Compensation (Becherketten mit Geschwindigkeitsausgleich), Paul Voss. Der praktische Maschinen-Konstrukteur, vol. 53, no. 19, May 13, 1920, pp. 173-176, 6 figs. Description of the ATG bucket elevators which, besides moving throughout at a uniform speed, shows marked improvements in regard to filling and emptying of buckets, etc.

Types. Types and Uses of Bucket Elevators, Clarence C. Brinley. Coal Trade Jl., vol. 50, nos. 51, 52 and 53, Dec. 17, 24 and 31, 1919, pp. 1453-1454, 1485-1486, 10 figs., and 1507-1508. Bucket elevators are classified into (1) centrifugal discharge type, (2) continuous discharge type, (3) gravity discharge type, and (4) perfect discharge type. These types are illustrated and their operating limits are discussed. Different types of chains and elevator casing are also taken up. Uses and advantages of continuous discharge elevators.

BUILDING CONSTRUCTION

Clay-Core Walls. Clay Construction (Der Lehmbau), K. Dümmler. Ziegelwelt, vol. 51, no. 27, July 10, 1920, pp. 301-304, 9 figs. Writer suggests use of bricks as facing for clay-core walls, and recommends use of quarter bricks therefor.

Concrete, Advantages of. Use of Concrete Increasing in All Permanent Construction. Concrete Products, vol. 18, no. 5, May 1920, pp. 15-17, 4 figs. Types of concrete construction used for building are reviewed. Special attention is given to reinforced-concrete flat slab which is said to be highest type of fire-resistive construction and to possess saving story height amounting to about one story in eight without cutting down usable clear headroom.

Concrete, Uses in. See Economical.

Cost Estimating. Elements That Must Be Considered in Cost Estimating. Eng. & Contracting, vol. 53, no. 20, May 19, 1920, pp. 567-569. Report of Committee on Cost Estimating of Northwestern Assn. of Gen. Contractors.

Costs. Curves of Building Cost Increases Used in Valuation Work, F. E. Barnes. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 702-703, 2 figs. Based on data compiled by valuation engineer of New York Central lines. Frame and brick structures are considered.

When Will Building Costs be Lower? Brick & Clay Rec., vol. 57, no. 3, Aug. 10, 1920, pp. 218-219, 2 figs. Study made by Fuller Indus. Eng. Corp. It is believed that no great financial depression will ultimately affect cost of materials and labor but that decline in building costs will be small and slow to follow downward trend of other commodities because of great demand of building space, which will not be changed, until shortage due to war has been eliminated.

Developments in Germany. Notable Constructions, Including Small Dwellings (Bemerkenswerte Bauausführungen mit Einschluss der Kleinwohnungsbauten), Heinrich Sielken. Beton u. Eisen, vol. 19, nos. 12-13 and 14, Aug. 5 and Sept. 4, 1920, pp. 133-136 and 155-158, 16 figs. Aug. 5: Review of reinforced-concrete construction work during war, including details of floats for salvaging U-boats; a silo of 14,000 cu. m. storage capacity; pressure pipe line, 4000 m. long with inside diameter of 1.80 m., mine storage buildings, etc. Sept. 4: Notes on Kossel rapid construction type of small dwelling with 22-cm. concrete walls, and its advantages in comparison to construction types.

Economical. Economical Building Construction (Sparbauweisen), Hans Paul Herrmann. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 10, Dec. 1919, pp. 303-318, 23 figs. Discussion of concrete construction, with notes on walls of solid concrete and hollow concrete blocks and walls with hollowed-out channels; description of different construction types by various firms. Notes on types of separate building parts, such as roofs, ceilings, floors, wall linings, etc.

Economical Speed. Economical Speed in Building, Angus B. MacMillan. Indus. Management, vol. 59, no. 5, May 1920, pp. 392-394, 3 figs. Figures are given which show for typical building how increasing cost of forms progresses as building period is successively shortened, and how at the same time overhead costs decrease with speed. Minimum is reached at point between most rapid and most leisurely construction.

Estimates in. The Expense of Estimating, Henry K. Holsman. Am. Architect, vol. 127, no. 2312, April 14, 1920, pp. 475-477. It is stated that present methods followed in estimating involve considerable duplication of effort. It is suggested that quantity survey should be furnished by owner with plans and specifications. This, it is claimed, would eliminate needless expense and insure uniform basis for bidding.

Fire-Prevention Methods. Building from a Fire Prevention Standpoint. Fire & Water Eng., vol. 67, no. 21, May 26, 1920, pp. 1080-1081, 5 figs. Suggestions as to proper construction of chimneys and fireplaces. Importance of lining flues to prevent chimney fires is pointed out.

Fire-Resistive. See COLUMNS, Fire Resistive.

German Regulations. Regulations for Load Assumptions in Building Construction and Permissible Stresses for Building Materials (Bestimmungen über die bei Hochbauten anzunehmenden Belastungen und über die zulässigen Beanspruchungen der Baustoffe). Zentralblatt der Bauverwaltung, vol. 40, no. 8, Jan. 28, 1920, pp. 45-50. Official report of ordinance issued by Minister of Public Works, Dec. 24, 1919. Gives tables of specific weight of various building materials and structural parts and of permissible loads and unit stresses.

The New Prussian Building Regulations with Special Regard to Determining of Buckling Resistance (Die neuen preussischen Hochbaubelastungsvorschriften unter besonderer Berücksichtigung der Bestimmungen über Knicksicherheit). Zentrallblatt der Bauverwaltung, vol. 40, nos. 7 and 9, Jan. 24 and 31, 1920, pp. 40-42 and 56-60, 6 figs.

Gypsum in. Gypsum Construction as a Fire Preventive, G. Lester Williams. Fire & Water Eng., vol. 67, no. 21, May 26, 1920, pp. 1084-1085 and 1098, 2 figs. Advantageous qualities are said to be resisting and insulating qualities, lightness and strength, and saving in cost and time.

Hotels. See HOTELS, King Edward, Toronto.

New York City. Ten Years' Building and Housing Activity in New York. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 598-599, 1 fig. Statistics.

Olympia Exhibition. The Building Exhibition at Olympia. Eng., vol. 109, no. 2833 and 2834, April 16 and 23, 1920, pp. 518-519 and 556-557, 3 figs. Briquetting press, concrete-tile machine and concrete road-making machine.

Organization for Rapid Work. Engineering and Construction Organization for Rapid Work, I. W. McConnell. The J. E. Aldred Lectures on Engineering Practice, 1919-1920, Johns Hopkins University, Dept. of Eng., 1920, pp. 159-184, 13 figs.

Ottawa, Ont. Construction of Parliament Buildings, Ottawa, F. D. Withrow. Can. Engr., vol. 39, no. 8, Aug. 19, 1920, pp. 253-255, 5 figs. Building is rectangular and measures 472 ft. by 245 ft. with central tower separated short distance from main front.

Porous Concrete Slabs. New Material Used in Manufacturing Building at Newark, N. J. Am. Architect, vol. 118, no. 2331, Aug. 25, 1920, pp. 255-260, 15 figs. Porous-concrete slabs. Mechanically produced pellets of neutral wax-like material are added to concrete. After slab is formed pellets are removed by application of heat.

Reinforced Concrete. Novel Design Features in Stromberg Motor Devices Building, G. E. Warren. Concrete, vol. 17, no. 2, Aug. 1920, pp. 36-42, 8 figs. Methods used for placing concrete in cold weather. Details of diagonal beams connecting wall girders with cupola.

Restoration of Buildings. Restoration of the Damaged Tower Foundation of the Strassburg Cathedral (Wiederherstellung der beschädigten Turmfundamente des Strassburger Münsters), Karl Bernhard. Zentralblatt der Bauverwaltung, vol. 40, no. 37, May 8, 1920, pp. 226-230, 7 figs. Method recommended of strengthening tower pier foundation was the construction of a sound foundation structure extending down to stable gravel soil and so constructed as to be able itself to bear total load. Account of preliminary work up to 1914, plan of construction, and progress of work up to end of 1918.

Rod Pisé Construction. The Lewandowsky Rod Pisé Construction (Der Stabpiseebau nach der Bauart Lewandowsky). Zentralblatt der Bauverwaltung, vol. 40, no. 26, Mar. 31, 1920, pp. 148-150, 4 figs. Describes building method using compressed clay and pisé which was tried out in construction of a group of small dwellings in Hildesheim and said to possess good insulating qualities and to effect a considerable saving in cost over brick construction.

Standardization. Need for Standardization in Construction, Ernest T. Trigg. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1073-1076. Necessitated, it is pointed out, by reason of advance in price of all building materials.

Standardization of Specifications. Practical Economics Secured by Standardization of Construction Specifications, R. C. Marshall, Jr. Am. Architect, vol. 117, no. 2302, Feb. 4, 1920, pp. 165-168. It is pointed out that Department of Public Works, in conference with national technical societies, could establish in most effective manner standard specification for Government work which would insure both safety and economy of design and results would in very few years pay thousand-fold return on investment. Extracts from address before Nat. Department of Public Works Assn.

Statistics of New Construction throughout United States. Public Rebels Against Closed Shop System. Iron Trade Rev., vol. 67, no. 8, Aug. 19, 1920, pp. 505-508, 1 fig. While building permits in United States show increase in recent months, it is generally estimated that twice as much construction would be undertaken as at present if labor conditions were more stable.

Steel Framing. Steel Framing for Public Hall in Cleveland. Eng. News-Rec., vol. 84, no. 9, Feb. 26, 1920, pp. 414-415, 7 figs. Special arrangement of steel stresses for hip-roof framing designed in order to avoid placing large columns at points where they would encroach upon inclines which take place of stairways between floors, and at the same time meet roof lines chosen by architect.

The Calculation of the Structural Steel Framing of Buildings (Die Berechnung der Stockwerkrahmen), Fr. Engesser. Eisenbau, vol. 11, no. 3, Feb. 17, 1920, pp. 81-88, 7 figs. Describes method of calculation and discusses its application under various load conditions.

Stucco. Successful Building in Stucco. Am. Architect, vol. 116, no. 2290, Nov. 12, 1919, pp. 615-621, 13 figs. Illustrating hollow wall tile construction.

Termite-Proof. Protecting Buildings Against the White Ant, Thomas E. Snyder. Eng. News-Rec., vol. 84, no. 23, June 3, 1920, pp. 1110-1112, 6 figs. States that Bur. of Entomology, U. S. Department of Agriculture, receives about 40 to 50 requests per year for information as to how to get rid of "flying ants" or white ants which damage foundation timbers and other woodwork of buildings in all parts of country. Suggestions of improper and proper

methods of building ground floor to protect against white ants. Most important remedy and preventive is complete isolation of all untreated wood from ground.

Termite Proof Building Construction in Formosa, Masamitsu Oshima. Eng. World, vol. 16, no. 7, May 1920, pp. 411-415, 8 figs. Treatment given to timbers used in building construction and cement layer spread over buildings in order to protect them against termite (Coptotermes formosanus) which is widely distributed throughout Formosa.

U. S. Army, Construction Division. The Work of the Construction Division of the United States Army from Coast to Coast, 1917-1919, E. B. Morden. Jl. Engrs. Club of Philadelphia, vol. 37-3, no. 184, March 1920, pp. 86-137, 50 figs. Scope, origin and evolution, and general demonstration of Construction Division is first outlined, and account of projects undertaken from 1917 to 1919 is subsequently presented, and article is concluded with general statistics of work of Construction Division.

Walls. See WALLS.

Wood. The Why and Wherefore of Building with Wood, C. J. Hogue. Country Life, vol. 37, no. 6, April 1920, pp. 51-53, 5 figs. Maintenance factors discussed.

[See also FIRE PROTECTION, Building Construction and.]

BUILDING LAWS

London, England. "The Law of Ancient Lights" and "London Building Act," George R. Mackenzie. Jl. Engrs. Club Philadelphia, vol. 36, no. 181, Dec. 1919, pp. 466-469. Review of early English building laws and London building act of 1894, with particular reference to their value in zoning.

Portland, Ore. The New Building Zone Ordinance of Portland, Oregon, Charles H. Cheney. Am. Architect, vol. 117, no. 2318, May 26, 1920, pp. 659-661. New ordinance is said to combine protective features of the Alameda, Los Angeles, St. Louis and New York zone ordinances, and applies to new building permits only. Eight kinds of classes of use districts were established, comprising two kinds of residence classes, two kinds of business classes, two kinds of industrial districts, and two special classes of the districts.

Toronto, Canada. Revision of Toronto's Building By-Laws. Contract Record, vol. 33, no. 47, Nov. 19, 1919, pp. 1063-1066. Regulations for flat-slabs among features of new code.

BUILDING MATERIALS

See GYPSUM BOARD; STUCCO.

BUILDINGS

Brick, Fire-Resisting. "Bricks without Straw," Ira H. Woolson. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 141-148. Advises National Fire Protection Assn. to adopt definite policy and use its influence collectively and individually in securing use of such "construction straws" in brick buildings as will make structures as a whole have a cohesive fire-resistance somewhat comparable with that of their walls.

Concrete. A Reinforced Concrete Canteen. Concrete & Constructional Eng., vol. 14, no. 11, Nov. 1919, pp. 631-637, 7 figs. Building measuring about 242 ft. by 50 ft. wide, wing portion being about 70 ft. by 50 ft. is provided by English works for comfort of workers.

Factory at Montreal for Crane Co., Ltd., Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1164-1166, 6 figs. Layout of flat slab reinforced concrete building.

Concrete, Dampproofing. The Protection of Concrete Buildings Against Damp. Eng. & Contracting, vol. 52, no. 27, Dec. 31, 1919, pp. 756-757, 5 figs. Illustrates methods of making joints between balcony projecting wall or chimney and roof. Translated from La Revue des Materiaux de Construction et de Travaux Publics.

The Protection of Concrete Buildings Against Damp and Water. Concrete & Constructional Eng., vol. 14, no. 10, Oct. 1919, pp. 579-582, 5 figs. Following proportions are suggested where dampness of water is to be combated: (1) for 4 parts of crushed stone ¼ to ½ in diameter, mixture of one part of cement and 2 parts of sand containing rather more fine grade than are needed to obtain concrete of maximum strength; (2) for smaller stones ½ in and less 1:2:2 mixture. From La Revue des Matériaux de Construction et de Travaux Publics.

Concrete, Moving. Electric Hoists Pull 3000-Ton Building 450 Feet. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, pp. 706-707, 3 figs. Arrangement of pulling cable which enabled three hoists to apply even pull on concrete building at twelve points.

Dampproofing. See Concrete, Dampproofing.

Fire Hazards. Miscellaneous Hazards in Building Operations. Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1166-1167. Danger of fire during construction due to lack of care in properly storing materials.

Floors. See FLOORS.

Foundations. See FOUNDATIONS.

Heat Losses from. Air Interchange and Heat Loss from Buildings, W. W. Nobbs. Domestic Eng. & Estate Engr., vol. 39, no. 11, Nov. 1919, pp. 155-162. Formulæ. Paper read before Instn. of Heating & Ventilating Engrs.

Maintenance. See BRIDGES, Maintenance.

Moving. A Novel Feat Accomplished in Moving a Chicago Building. Am. Architect, vol. 117, no. 2318, May 26, 1920, pp. 662-666, 9 figs. Describes relocating a building which was cut in half, swung around and put together again, operation proving good financial investment. No damage in plastering or cracking of brick walls occurred during moving and both sections were found to be intact after having been reset on new foundations.

Office. See CONCRETE CONSTRUCTION, REINFORCED, Office Buildings.

Steelwork. Common Errors in Detailing Steelwork for Buildings, Edward Godfrey. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 730-733, 8 figs. Specially those occurring in eccentric loads, cantilever beams and curved beams.

Vibration Prevention. Means Employed for Preventing Transmission of Vibrations to Buildings (Moyens d'empêcher la transmission des vibrations aux bâtiments). Industrie Électrique, vol. 29, no. 661, Jan. 10, 1920, pp. 1-2, 6 figs. Gerb anti-vibrator and other types are described.

Wooden, Fireproofing. See FIREPROOFING, Concrete for.

[See also CHURCHES; FACTORIES; FLOORS; GARAGES; HANGARS; HIPPODROMES; HOUSES; HOUSES, CONCRETE; STRUCTURES; THEATERS.]

BULKHEADS

Concrete. A Low Cost Concrete Bulkhead, Hunley Abbott. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, p. 726, 3 figs. Bulkhead was built by driving line of concrete piles on 10 ft. centers and placing back of these piles

series of reinforced-concrete slabs which spanned from pile to pile.

Stiffeners for. An Analysis of Stresses in Bulkhead Stiffeners (Bracketed End Connections). Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 729-734, 5 figs. Data figured on assumption that brackets fix ends of stiffeners absolutely.

Watertight. A Test of Watertight Bulkheads for Ship Subdivision, Archibald Hogg. Engineering, vol. 108, no. 2814, Dec. 5, 1919, pp. 762-763, 3 figs. Committee report presented befort Northeast Coast Instn. of Engrs. and Shipbuilders.

BULL RINGS

See PISTONS, Locomotive.

BULLETS

Steel, Manufacture of. The Manufacture of Steel Bullets (Herstellung kleiner Stahlgeschosse), Eugen Simon. Werkstattstechnik, vol. 14, no. 7, Apr. 1, 1920, pp. 206-209, 21 figs. Describes machinery and hardening methods. Information derived principally from inspection of Berlin factories.

BUNGALOWS

See HOUSES, Bungalows.

BUNKERS

Stone-Storage. See STONE, Storage Bunkers.

BUREAU OF MINES

See U. S. BUREAU OF MINES.

BUSES

Baltimore, Operation. How Buses Are Run in Baltimore, L. H. Palmer. Elec. Ry. Jl., vol. 55, no. 1, Jan. 3, 1920, pp. 13-17, 7 figs. Writer believes there is limited field for buses in city transportation at fares higher than in cars.

Street Railway vs. The Place of the Bus, Walter Jackson. Elec. Ry. Jl., vols. 55 and 56, nos. 14 and 5, Apr. 3 and July 31, 1920, pp. 683-689, 6 figs. and 209-218. Apr. 3: Details are presented of relative costs of car and bus operation in Great Britain, together with some notes on bus design, weight and capacity, operating speeds, legal regulations, and fuel and roadway taxes. July 31: Opinion is expressed that at present costs the bus may supplement but cannot, from economical point of view, supplant electric railway upon basis of equal fare and responsibilities.

[See also MOTOR BUSES.]

BUSHINGS

Conical, Calculation of. Study on the Calculation of Conical Bushings (Beitrag zur Berechnung von kegeligen Hülsen), H. Bonte. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 38, Sept. 20, 1919, pp. 823-926, 11 figs. Used in connecting piston and piston rod, crosshead and piston rod, etc.

Electrical Apparatus. Interchangeable Bushings for High Voltage Apparatus, Eugene D. Eby. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 865-875, 20 figs. Standard types manufactured by Gen. Elec. Co. Curves showing variation in flashover point with change in altitude and correction factor for different altitudes, as well as other technical data obtained by Company's High Voltage Bushing Eng. Dept., are given.

BUYING

Efficient. Specializing in Efficient Buying, Robert N. Ladd. Iron Trade Rev., vol. 65, no. 25, Dec. 18, 1919, pp. 1650-1651. Separate department with trained men in charge considered just as necessary to successful conduct of business as sales, auditing or other departments. Requisites of an able executive.

C

CABLE TRAMWAYS

Lumber Conveying. Cable Tramways for Transportation of Lumber (Kabelkrane für Holztransport). Die Holzwelt, vol. 6, no. 68, Aug. 26, 1919, pp. 4-6, 8 figs. Description and illustrations of several conveyors, built by firm in Leipzig-Gohlis, which, it is said, can span several hundred meters and reach any point from above with ease.

Two-Bucket, Design. Design of Two-Bucket Aerial Tramway, Douglas Lay. Eng. & Min. Jl., vol. 109, no. 25, June 19, 1920, pp. 1359-1361, 12 figs. Simple carrier adapted to lowering ore from mine to terminal below mine outlet. Loading and discharge bins. General layout of line and formulæ for power.

Types. Development and Usefulness of Cable Tramways (Entwickelung und Verwendungsmöglichkeiten der Kabelkrane), M. Kunz. Zeitschrift für das Berg-Hütten und Salinenwesen, vol. 67, no. 3, 1919, pp. 160-184, 42 figs. Historical development up to time of introduction into Germany. Details and use of stationary, radial or revolving, and parallel-running cable tramways.

CABLES

Chain. See CHAIN, Navy Stud Cable.

Deflections, Computation of. A Simple Method of Computing Deflections of a Cable Span Carrying Multiple Loads Evenly Spaced, F. C. Carstarphen. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 5, May 1920, pp. 793-808, 2 figs. Method for computing deflections of multiloaded spans when loads are spaced uniformly. Method is applicable to calculations involved in determining length of suspender rods for suspension bridges, position of rolling loads on aerial tramway cable spans and construction of messenger or electric transmission lines.

Electric. See CABLES, ELECTRIC.

Hoisting. See CABLES, HOISTING.

Submarine. See SUBMARINE CABLES.

CABLES, ELECTRIC

Aluminum, Armored. The Use of Armored Aluminum Cables for Feeding the Lines of Electric Railways (Emploi des cables armés en aluminium, pour l'alimentation des installations de traction électrique), M. Peridier. Revue générale de l'Électricité, Supplement vol. 7, no. 14, April 3, 1920, pp. 79-94. Practice and experience during last five years of Compagnie générale des Omnibus de Paris. Technical comparison of aluminum and copper conductors is effected and experience of Paris company is said to establish that aluminum conductors give perfectly satisfactory service.

Aluminum-Iron and Aluminum-Steel. Aluminum-Iron and Aluminum-Steel Cables for Heavy Current Transmission (Aluminium-Eisen und Aluminium-Stahl-Seile für Starkstromleitungen),

E. G. Fischinger. Elektrotechnische Zeitschrift, vol. 40, no. 33, Aug. 14, 1919, pp. 393-394, 2 figs. Intended to replace copper cables. It is claimed that after having been installed for two years, no unfavorable symptoms were observed.

Armored, Construction of. Gutta Percha in Cable Construction. Raw Material, vol. 1, no. 8, Nov. 1919, pp. 391-395, 2 figs. Construction of heavily armored cable.

Armored, Defects in. Defects in Armored Cables (Recherche des défauts dans les câbles armés), G. Lebaupin. Electricien, vol. 49, no. 1242, Dec. 15, 1919, pp. 250-252. Based on writer's experience with line of 350 km. carrying energy at 15,000 volts.

Breaks Inside Strands. Investigation of a Discarded Cable with Cable Breaks Inside of Strands (Untersuchung eines abgelegten Drahtseiles mit Drahtbrüchen im Innern der Litzen), M. Rudeloff. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 1, Jan. 1920, pp. 33-54, 26 figs. Investigations of strength, hardness and structure of cable did not explain with certainty the causes for the breaks; material seemed to be sensitive to shearing loads and it is possible that the extent of cold stretching was considerable, which might have favored the breakings; also, that the first (inside) and second layer in the strands were stressed to a much greater extent by the operating load than the outside ones.

Breaks, Localization of. On the Localization of High-Resistance Breaks in Submarine Cables, A. Poulsen. Elecn., vol. 84, no. 2183, March 19, 1920, pp. 312-315, 3 figs. Corrections are proposed for Siemens method which consists in determining resistance of cable up to break by means of combined resistance and capacity test.

Capacity of. The Capacity and Insulation of Cables, E. S. Ritter and A. Morris. Post Office Elec. Engrs. Jl., vol. 12, part 4, Jan. 1920, pp. 229-242, 12 figs. Formulæ.

Characteristics of. Characteristics of Three-Phase Lines for Harmonics of Third Order (Constantes caractéristiques des lignes triphasées pour les harmoniques 3), R. Swyngedauw. Revue générale de l'Electricité, vol. 7, nos. 15 & 16, April 10 and April 17, 1920, pp. 483-492 and pp. 515-526, 6 figs. Formulæ for electrical characteristics of long armored cables in underground lines. Phenomena in lines not exceeding 20 or 30 km. can well be studied, it is stated, neglecting effective resistance and reactance and taking into consideration only persistence and susceptance. Experimental measurements of reactance, impedance and resistance of cables 4 to 10 km. long.

Combined Telephone and Telegraph. Combined Telephone and Telegraph Cables: Important Trials, A. H. Roberts and W. J. Hilyer. Post Office Elec. Engrs. Jl., vol. 13, part 1, April 1920, pp. 29-48, 13 figs. Tests made on 76-pair 40-lb. balanced telephone cable in order to ascertain practicability of providing combined telephone and telegraph cables between London and Manchester. Over loop circuit 186 miles in length, speed of 150 words per minute duplex was obtained with 40 volts on differential system and 60 volts on bridge system; induction on loaded telephone pairs was less from differential than from bridge Wheatstone working. Other results are mentioned.

Conduits. Thermal Conductivity of Underground Ducts, Willard S. Wilder. Elec. World, vol. 75, no. 1, Jan. 3, 1920, pp. 14-17, 7 figs. Testing methods.

Current-Carrying Capacity. Current-Carrying Capacity of Electric Cables, U. S. Navy, Alexander M. Charlton. Jl. Am. Soc. Naval Engrs., vol. 31, no. 4, Nov. 1919, pp. 794-817, 1 fig. Calculations of wire and fuse sizes.

Dielectric Losses in. Energy Losses in Dielectric of Industrial Cables (Sur la perte d'énergie dans le diélectrique des câbles industriels), G. Rennesson. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 10, March 8, 1920, pp. 587-589. Also in Revue generale de l'Electricité, vol. 7, no. 18, May 1, 1920, pp. 579-581, 3 figs. Account of experiments conducted in order to test conclusions reported by M. Swyngedauw in Comptes rendus, vol. 168, p. 230, where he states that losses decrease when temperature of cable increases.

The Expression of Dielectric Losses in Cables, Wm. A. Del Mar. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 55-56, 2 figs. Method is suggested which consists in expressing specific quality of insulation with respect to dielectric losses in terms of product of its power factor and specific inductive capacity.

Ducts for. See Conduits.

Faults, Localization of. Localization of Faults in Heavy Current Cables Due to Contact between All Conductors (Die Fehlerortsbestimmung in Starkstromkabeln bei Schluss zwischen allen Leitern), K. de Koning. Elektrotechnische Zeitschrift, vol. 41, no. 13, Apr. 1, 1920, pp. 249-250, 5 figs. It is shown that in this case it is absolutely necessary to obtain an accurate idea of character of disturbance before attempting to locate fault, because otherwise incorrect results may be obtained. Describes method for accurate localization of fault in frequently occurring event that one of the intermediate resistances is large and another is small.

New Methods for Localization of Water Faults in Paper and Fiber-Covered Cables (Neue Methode zur Ortsbestimmung von Wasserfehlern in Papier- und Faserstoffkabeln), Hermann Tietgen. Elektrotechnische Zeitschrift, vol. 41, no. 15, Apr. 15, 1920, pp. 292-293, 1 fig. Gives method of measurement with a described connection of the Wheatstone bridge which, it is claimed, has given good results in practice, is simple, reliable, and can be highly recommended.

Glands for. British Standard Specification for Watertight Glands for Electric Cables. British Eng. Standards Assn., no. 94, 1920, 12 pp., 7 figs. Watertight glands for following purposes are included in specification: (1) decks, (2) bulkheads, (3) cast-metal boxes and (4) sheet-metal boxes. Specification was approved on July 15, 1920.

High-Tension. High-Tension Electric Cables (Notes et remarques sur les cables électriques, à haute tension), M. Lebaupin. Bulletin de la Société française de Électriciens, vol. 9, no. 82, July 1919, pp. 447-458 and (discussion) pp. 458-464, 1 fig. Concerning installation, testing and exploitation of network of cables transmitting energy at 15,000 and 5,000 volts.

High-Tension Cables for Gotthard Traction, (Hochspamungs Rabel für die Gotthard-Traktion), Markus Dumermuth. Schweizerische Bauzeitung, vol. 74, no. 16, Oct. 18, 1919, pp. 193-196, 7 figs. It is noted that in order to judge electric strength of high-tension cable it is necessary to know the quality of insulating material and especially the stress of the innermost layer of insulating material. Calculation of dependence of this stress on voltage, diameter of cable and thickness of layer of insulating material is discussed.

Insulation. See Capacities of.

Joints. Report of Committee IX—Wires and Cables. Ry. Age (Daily Edition), vol. 68, no. 11b, Mar. 17, 1920, pp. 882-884, 8 figs. Speci-

fications for wire joints and copper bond wires recommended by committee of Am. Ry. Eng. Assn.

Lead-Covered. The Current-Carrying Capacity of Lead-Covered Cables, Ralph W. Atkinson. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 9, Sept. 1920, pp. 831-839, 3 figs. Data whereby carrying capacity of lead-covered cables can be calculated on basis of thermal limitations. Appendix, containing some numerical examples illustrating use of data, and a chart by which it is possible to determine graphically, for given conditions, the carrying capacity of three-conductor paper and varnished cloth cables installed in conduits.

Overvoltages. Overvoltages in Armored Cables and How to Prevent Their Occurrence (Surtensions par câbles armés et les moyens d'y parer), P. Bougherot. Revue générale de l'Électricité, vol. 7, no. 21, May 22, 1920, pp. 675-689, 7 figs. Computation of overvoltage occurring in long armored cable carrying alternating current when cable becomes grounded at or near the end of the line. Attention is directed to overvoltage produced by magnetic saturation of straining straps.

Submarine. Notes on the Localisation of Breaks or Faults in Submarine Cables, J. F. Lloyd. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 498-500, 1 fig. How to calculate combined apparent resistance due to polarization and earth current.

The Magnetic Field of an Ocean Cable Fed with Alternating Current (Das magnetische Feld eines mit Wechselstrom gespeisten Seekabels), H. Lichte. Elektrotechnische Zeitschrift, vol. 41, no. 5, Jan. 29, pp. 88-90, 16 figs. Results of experiments carried out in 1918 to determine course of magnetic field over surface of water in vicinity of cable, the distortion of field caused by iron ship hulls, and the influence of length of cable and depth of water on intensity of magnetic field. Report from laboratory of Submarine Signal Department of the Torpedo Inspection Board at Kiel.

Suspended, Stresses in. Stresses in Suspended Wires and Cables, F. E. Austin. Elec. Rev. (Chicago), vol. 77, no. 6, Aug. 7, 1920, pp. 203-206, 2 figs. Solution by means of laws and equations of catenary of fundamental problems of transmission-line stresses, including effect of temperature, wind and sleet on suspended wires.

Telephone. Submarine Telephone Cables (Cavi telefonici sottomarini). Industria, vol. 34, no. 13, July 15, 1920, p. 345. Recommendations issued by Italian postal authorities. Details of telephone cables in Straits of Messina.

Testing. Testing High-Voltage Cables with Direct Current (Ueber die Prüfung von Hochspannungskabeln mit Gleichstrom), M. Weiset. Elektrotechnische Zeitschrift, vol. 41, nos. 3 and 4, Jan. 15 and 22, 1920, pp. 48-51 and 71-74, 11 figs. Account of investigations in which the Delon connection for high-voltage rectifiers was used. Results of experimental investigation of two high-voltage rectifiers of different capacities under different conditions. Occurrences in connection with charge of cable are described and investigation is made as to whether it is possible under unfavorable conditions to detect and burn out a cable fault.

Underground. Underground Electric Cables (Câbles souterrains d'alimentation), L. Sekutowiez. Industrie des Tramways et Chemins de Fer, vol. 14, nos. 161-162, May-June 1920, pp. 85-100, 14 figs. Technical conditions with which armored cables must comply. Aluminum as conductor. Data on direction of underground cables. Report prepared for presentation to the International Congress which was to be held at Budapest in 1914.

Unipolar. Unipolar Cables with Lead Sheathing (Câbles unipolaires sous enveloppe de plomb), P. Capdeville. Revue générale de l'Électricité, vol. 8, nos. 6 and 11, Aug. 7 and Sept. 11, 1920, pp. 177-181, 8 figs. and 339-344, 14 figs. Formulæ for calculating, for a given network, currents and voltages induced in lead and their influence on characteristics of copper conductor. Application of theory worked out to three-phase line to transport 30,000 kw.

Working Stresses. Allowable Working Stresses in High-Voltage Electric Cables, Charles W. Davis and Donald M. Simons. Elec. Jl., vol. 17, no. 7, July 1920, pp. 292-298, 2 figs. Data are given which show that large number of installations have been operated for many years with maximum stress at surface of conductor far in excess of 19.5 kv. per cm. Ionization stresses discussed in detail.

CABLES, HOISTING

Care of. Selection and Care of Hoisting Cables, Contract Rec., vol. 33, no. 44, Oct. 29, 1919, pp. 998-1001, 1 fig. Defects to which ropes and chains are subjected and measures to be taken to prevent accidents in hoisting operations.

Flexibility. Should the Flexibility of Haulage Rope Be Computed? (Sollen Forderseile auf Biegung berechnet werden?), O. Speer. Glückauff, vol. 55, nos. 44 and 45, Nov. 1 and 8, 1919, pp. 849-853 and 869-878, 13 figs. Gives tables of cable data from which author concludes that the bending stress has no great bearing on the life, strength and efficiency of the main haulage cable, and in calculation of cable, its flexibility need not be taken into account.

Impairment. Jolting one of Causes of Damage to Hoisting Cables (Staunchungen als Ursache von Förderseilschäden), Heinrich Weber. Glückauf, vol. 55, no. 17 and 18, Apr. 26 and May 3, 1919, pp. 297-301 and 313-317, 3 figs. Writer believes that jolting is principal cause of damage and most of other causes mentioned may be traced to it.

Mine Installations. The Installation of a Shaft Cable at Kirkby Colliery, Joseph Bircumshaw. Colliery Guardian, vol. 119, no. 3088, Mar. 5, 1920, pp. 657-658, 9 figs. Cable is three-core cable 0.25 sq. in. in area, paper-insulated, bitumen-sheathed, double-wire armored, and carries 3300 volts. Method of lowering cable into position in shaft by winding engines is explained.

Mine, Sudden Stresses in. Analytical Study of Effect of Sudden Stresses in Mine Cables (Étude analytique de l'action des chocs sur les cables d'extraction), M. Delbrouck. Revue Universelle des Mines, vol. 5, no. 3, May 1, 1920, pp. 187-219, 6 figs. A formula is derived which involves velocity of propagation of stresses in cable. By application of formula it is found that hemp cable is almost 50 per cent stronger for sudden impacts than steel.

Selection. See Care of.

CABLEWAYS

Aerial. Aerial Ropeway at Walkmill Colliery. Colliery Guardian, vol. 119, no. 3099, May 21, 1920, pp. 1430-1431, 4 figs. Brief description and illustrations of aerial ropeway installed by British Ropeway Eng. Co., Ltd., London, with details of loading, driving and tension station, the terminal station, and method of working.

Aerial Tramways, Douglas Lay. Eng. & Min. Jl., vol. 109, no. 9, Feb. 28, 1920, pp. 559-562, 16 figs. Advocates turning of cables to equalize wear; angles of deflection are said to be

important and large sheaves or groups of small sheaves necessary. Notes on location of supporting tower.

Army Supply Transportation. Cableway Built in 1915 for Transportation of Supplies to Army in Alsace (Transporteur funiculaire de Retournemer), F. Mertz. Génie Civil, vol. 75, no. 18, Nov. 1, 1919, pp. 417-421, 13 figs. Cableway was nearly 4 miles long. It was operated electrically.

Coal-Storage. Spans Simplify Coal Storage, John Sinclair. Gas Rec., vol. 16, no. 9, Nov. 12, 1919, pp. 67-71, 6 figs. Instances where cableways are said to have proved extremely flexible in storing and reclaiming coal for public utilities.

Construction. The Construction of Cableway Carriages with Regard to Life of Rope (Wie sollen in Rücksicht auf die Lebensdauer der Seile die Drahtseilbahnwagen beschaffen sein?), R. P. Schröder. Fördertechnik u. Frachtverkehr, vol. 13, nos. 12 and 13, June 11 and 25, 1920, pp. 110-113 and 118-121, 19 figs. Notes on stress of track cable under carriage; practicable development of wheels; different types of carriages and their influence on stress and life of track cable; traction rope clamps and their effects on traction and track cable.

Dorada, Columbia. The Dorada Ropeway in Columbia. Engr., vol. 129, no. 3359, May 14, 1920, pp. 511-512, 9 figs. 7 on p. 504. Constructed on the mono-cable system according to designs of Ropeways, Ltd. Notes on capacity, storage, stations, power, etc. States that 437 trestles are required for supporting rope and loads between various stations; rope is of ordinary Lang's lay construction, wires being drawn from extra quality plow steel, having breaking strain of 105 tons per sq. in.

Semi-Portable. Semi-Portable Aerial Ropeway. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 80-82, 20 figs. Ropeway erected to handle timber on Lond. and South-Western Ry.

Stresses on Cable. Influence of Moment of Inertia of Cableway Carriages on the Stress of the Track Cable (Einfluss des Trägheitsmomentes der Radgestelle von Drahtseilbahnwagen auf die Beanspruchung der Tragseile), R. P. Schröder. Fördertechnik u. Frachtverkehr, vol. 13, nos. 10 and 11, May 14 and 28, 1920, pp. 95-97 and 102-104, 8 figs. Investigates conditions in connection with the crossing of the cableway car over the couplings and points out what measures should be taken to reduce the stress of rope at this point by the car rolling over it and to increase its life; it is shown that the increasing moment of inertia has considerable influence on the durability of rope.

Timber Transportation. Ropeways for the Transport of Timber, P. Stephan. Eng. Progress, vol. 1, no. 9, Sept. 1920, pp. 279-281, 10 figs. Transport upon wooden runners and by means of field railways; ropeways for wide spans. Details of construction and economy.

See also Semi-Portable.

CADMIUM

Electrodeposition of. See ELECTROPLATING, Cadmium.

CAISSONS

Calculation of. The Calculation of Caissons for Compressed-Air Foundation Work (Beitrag zur Berechnung von Senkkasten (Caissons) für Druckluftgründungen), Ed. Swoboda. Beton u. Eisen, vol. 18, no. 19-20, Dec. 4, 1919, pp. 213-216, 6 figs. Formulæ for computing ultimate stresses of floor beams and supporting wall.

Concrete. Concrete Caissons for Breakwater Construction, J. A. B. Tompkins. Eng. World, vol. 16, no. 8, June 1920, pp. 467-471, 7 figs. Standard design being built in Milwaukee for Indiana Harbor, Ind. Caisson is 54 ft. long with vertical interior cross-walls dividing it into four compartments.

Concrete Caissons for Breakwater Construction, J. A. B. Tompkins. Military Engr., vol. 12, no. 62, Mar.-Apr. 1920, pp. 127-130 and 169-173 and (discussion) pp. 173-175, 8 figs. Detailed description of standard concrete caisson adopted by Milwaukee, Wis., district, including notes on design, construction plant and methods, launching, towing, placing in breakwater, and costs.

Sinking Methods. Methods Employed in Sinking Large Open Caisson. Eng. News-Rec., vol. 84, no. 19, May 6, 1920, pp. 916-918, 7 figs. Depth of final penetration controlled by friction collar. Winter concreting made safe by heated housing.

CALCIUM

Analysis. Analysis of Calcium and Magnesium in Saline Media (Du dosage du calcium et du magnésium dans différents milieux salins), E. Canals. Bulletin de la Société chimique de France, vol. 25-26, no. 12, Dec. 1919, pp. 655-658. Comparison of various volumetric methods.

Arsenates of. The Arsenates of Calcium. I. Equilibrium in the System Arsenic Pentoxide, Calcium Oxide, Water at 35 Deg. (Acid Section), C. M. Smith. Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 259-265, 1 fig. Writer states that two compounds have been found to be stable under conditions of experiment, dicalcium orthoarsenate monohydrate and monocalcium orthoarsenate, existing below and above, respectively, an acid concentration corresponding to 27.5 deg. arsenic pentoxide.

Electrolytic Production. The Electrolytic Production of Calcium, P. H. Brace. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 6, pp. 69-82. Results of experimental investigations of electrolytic process for production of calcium. Three types were experimented with: submerged-cathode type, moving-cathode type, and a modified form of cell developed in course of investigation. Last mentioned cell was found to be "far easier to operate than either of the cells."

Methods of Estimation. Calcium, George E. Ewe. Chem. News, vol. 121, no. 3146, July 30, 1920, pp. 53-56. Comparison of ten different methods of estimation. From Bul. of Int. Metallurgical & Chem. Soc.

CALCIUM SULPHIDE

Mechanical Handling. See HANDLING MATERIALS, Pneumatic System for Calcium Sulphide.

CALORIMETERS

Coal. Coal Calorimetry. Times Eng. Supp., no. 542, Dec. 1919, p. 363. Operation of open-type instrument.

Construction. Calorimeters. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 95-97, 3 figs. How constructed and used.

Testing Heat Values of Fuels. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 97-99, 3 figs. Calorimeters, their construction and use.

CALORIZING PROCESS

See METALS, Calorizing; STEEL, Oxidation, Prevention of.

CAMERAS

Aerial. See AERIAL PHOTOGRAPHY, Automatic Camera.

Polar High-Speed. The Polar, Multi-Exposure, High-Speed Camera, J. W. Legg. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 509-512, 5 figs. Examples of stereoscopic photographs of arc.

CAMS

Design. Cam Design. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 361-363, 12 figs. Elements of layout and arrangement.

Cam Design and Construction, Franklin DeR. Furman. Am. Mach., vol. 52, nos. 19 and 22, May 6 and 27, 1920, pp. 987-999, 13 figs., and 1129-1135, 16 figs. Elliptical arc for rolling cams. Effect of swinging transmitter arm between ordinary radial cam and follower.

Cam Operation of Valves, T. L. Sherman. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 2-5, 12 figs. Analytical design of cams of predetermined performance.

Rational Study of Mechanisms Operated by Cams (Étude rationelle des méchanismes commandés par cames), Octave Lepersonne. Revue Universelle des Mines, vols. 2, 3 and 6, nos. 2, 1 and 2, June, Sept.-Oct. 1919 and July 15, 1920, pp. 193-284, 32 figs., 73-109, 9 figs. partly on 4 supp. plates and 122-126. June: Profiles composes of straight lines and arcs of circle; Sept.-Oct.: With special reference to design of cams for operating valves of internal-combustion engines; July: Formula for dimensions of cam in terms of those of return springs.

See also Tangential.

Lathe for Turning. See LATHES, Camshaft, Gordon.

Tangential. Cam Design and Construction, Franklin DeR. Furman. Am. Mach., vol. 52, no. 1, Jan. 1, 1920, pp. 21-27, 14 figs. Tangential cams.

Valve. See Design.

CANAL BOATS

See RIVER VESSELS, Coal Barges.

CANALS

Cleves-Rhine. The Spoy Canal Between Cleves and the Rhine River (Der Schiffahrtweg "Cleve-Rhein"—Spoy-Kanal), H. Berkenkamp. Zeitschrift für Bauwesen, vol. 70, no. 1-3, 1920, pp. 95-106, 12 figs. Discussion of the technical details, traffic conditions and construction costs.

Construction Railroad. Construction Railroad Along the Queenston-Chippawa Canal, Harry Gardner. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 11-14, 7 figs. Railway system consists of double track main line, single-track loading line and three yards on west side of canal and single-track pump line on east side.

Electric Traction on. Electric Traction on Canals (La traction électrique sur les canaux), M. Tumerelle. Bulletin de la Société française des Électriciens, vol. 10, no. 89, May 1920, pp. 187-198, 1 fig. Economical study based on results of operating various canals electrically in France.

Great Lakes-Atlantic Ocean. The St. Lawrence Route and Welland Ship Canal, Alex. J. Grant. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 425-434, 11 figs. Origin, development and construction of canals that form navigation system connecting Great Lakes with Atlantic Ocean via St. Lawrence Route.

Head Gates. Discharge Coefficients for Canal Head Gates, J. S. Longwell and Julian Hinds. Eng. & Contracting, vol. 52, no. 20, Nov. 12, 1919, pp. 552-555, 11 figs. Points out limitations to be observed in application of formula $Q = A\ C\ \sqrt{2gh}$ where Q is discharge, A is area of orifice, C is coefficient determined by experiment, and h is effective head. Also in Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 31-35, 5 figs.

Inverted Siphon. Design and Construction of Notus Canal Inverted Siphon. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 860-861, 3 figs. Reinforced-concrete inverted siphon 2000 ft. long with capacity of 120 sec.-ft.

Irrigation. Lining Irrigation Canals with Concrete Without Forms, Francis Cuttle. Eng. News-Rec., vol. 85, no. 1, July 1, 1920, pp. 17-18, 4 figs. Tells how permanent concrete mortar lining was economically and quickly placed on canals in Southern California.

See also IRRIGATION, Canal Cleaning; Canals; Concrete-Lined Canals.

Lake Washington, Seattle. Lake Washington Ship Canal, Seattle, Wash., A. W. Sargent. Military Engr., vol. 12, no. 64, July-Aug. 1920, pp. 231-330, 8 figs. Length of canal between deep water in Puget Sound and deep water in Lake Washington is 8 miles. Dredged channel below locks is 150 feet wide at bottom and 30 feet deep at low water.

Locks. General Design of a Lock and Approaches, J. W. LeB. Ross. Jl. Eng. Inst. of Canada, vol. 3, no. 8, Aug. 1920, pp. 383-386, 14 figs. Considerations based on records of operation of Canadian canal at Sault Ste. Marie.

Manufacture and Testing of Large Chains for the Fenders in the Panama Canal Locks, Henry Goldmark. Jl. Western Soc. Engrs., vol. 24, no. 2, Feb. 1919, pp. 88-101, 9 figs. Average breaking strength of four test chains was found to be 514,250 lb. Summary of specification for chains as developed from results obtained in tests is presented.

Tests of the Chain Fenders in the Locks of the Panama Canal, Henry Goldmark. Trans. Eng. Inst. of Canada, vol. 32, part 2, Jan. to June 1918, pp. 329-360, 28 figs. Tests made during construction of foundries and also since canal has been open for use.

The Lock Foundation, Inner Harbor Navigation Canal, New Orleans, La.—The Problem and the Solution, Geo. R. Goethals. Proc. La. Eng. Soc., vol. 6, no. 3, June 1920, pp. 134-158, 8 figs. Lock is located 2000 ft. measured along canal channel, from river. Canal prism between river and lock will be 125 ft. wide, with 30 ft. minimum depth; and between lock and lake, bottom width of 150 ft. and minimum depth of 30 ft. will be provided. Unique feature is that high-level pool may be either on river side or on lake side.

New Orleans Harbor. New Orleans Industrial Canal and Inner Harbor near Completion, Thomas Ewing Dabney. Manufacturers Rec., vol. 76, no. 21, Nov. 20, 1919, pp. 124-126, 5 figs. Details of 1100-feet lock.

Unwatering the Lock Site of New Orleans Harbor Canal, George R. Goethals. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 940-943, 2 figs. Sheet-pile cofferdams, driven in successive rows nearer and nearer to lock, cut off porous underlying quicksand strata which are tapped with flowing wells as dams close in.

New York State Barge. The New York State Barge Canal, Frank M. Williams. Sci. Am., vol. 122, nos. 1 and 2, Jan. 3 and 10, 1920, pp. 14-15, 40-41 and 51, 13 figs. How some of engineering problems involved in construction were met, particularly that of obtaining sufficient water to provide for minimum depth at all times.

The New York State Barge Canal, E. S. Walsh. Sci. Am., vol. 122, no. 5, Jan. 31, 1920, pp. 112-113 and 122, 10 figs. Economic aspects of canal—its present and prospective carrying capacity and expectation of traffic.

See also TERMINALS, MARINE, Barge Canal, New York.

Queenston-Chippawa Power. See HYDROELECTRIC DEVELOPMENT, Queenston-Chippawa.

Rhone-Rhine. Reconstruction of Rhone-Rhine Canal to Permit Navigation of 300-Ton Lighters (La transformation du canal du Rhone au Rhin et sa mise au gabarit de 300 tonnes), Auguste Pawlowski. Génie Civil, vol. 76, no. 9, Feb. 28, 1920, pp. 225-231, 17 figs. partly on supp. plate. Attention is directed especially to organization of constructional work.

Spillways for. See RESERVOIRS, Spillways for.

Switzerland. The Swiss Rhone-Rhine Navigation Project, A. Wharton Metcalfe. Engr., vol. 129, nos. 3348 and 3350, Feb. 27 and Mar. 12, 1920, pp. 212-214, 3 figs., and 264-265, 1 fig. Discussion of economical aspects of project under consideration by Swiss Government for over ten years, together with maps showing proposed works between Geneva and Seyssel.

Trans-Prussian. The Trans-Prussian Canal (Der Mittellandkanal), H. Sympher. Zentralblatt der Bauverwaltung, vol. 40, no. 16, Feb. 25, 1920, pp. 97-104, 6 figs. In 1918 the Prussian House of Representatives recommended that construction of a through canal from east to west boundary of Prussia be submitted to the Diet. Details with maps of preliminary plans are given, and it is concluded that prospects are favorable for the expansion of the German waterways.

Warrior River Barge Canal. Development of Warrior River Barge Canal, Robert S. Thomas. Int. Mar. Eng., vol. 25, no. 3, March 1920, pp. 193-198, 6 figs. Gives brief account of development of waterway, shows volume of commerce which it carries and describes development of transportation methods, giving details of present vessel equipment.

Wasteways. Electrically Operated Wasteways of the Tieton Canal, C. F. Gleason. Jl. Electricity, vol. 43, no. 10, Nov. 15, 1919, pp. 464-465, 2 figs. There are five wasteways located at about two miles intervals, each being of sufficient capacity to discharge total flow of canal.

Welland Ship. Progress on New Welland Ship Canal. Can. Engr., vol. 39, no. 11, Sept. 9, 1920, pp. 319-330, 24 figs. partly on supp. plate. Estimated quantities of excavation, concrete and embankments. Review of canal's history, purpose, design and construction, with special reference to 1919 and 1920 work. Program for 1921.

CANNERIES

Wastes. See WASTES, Canning-Plant, Treatment of.

CANNING PLANTS

Wastes. See WASTES, Canning-Plant.

CANNON

Gearing to Aeroplane Engines. Report of Test of 37-mm. Automatic Cannon in Cannon Engine. Air Service Information Circular, vol. 1, no. 32, May 5, 1920, 6 pp., 6 figs. At slow speeds of operation of engine, cannon-hopper casting vibrates sufficiently to seriously affect fire. At normal operating speed of engine vibration continues and prevents proper rate of automatic fire of cannon. Firing of cannon has no apparent effect on operation of engine.

CANS

Manufacture. Here is How the Whitthall Co. Produce Tin Cans, J. H. Rodgers. Can. Machy., vol. 23, no. 22, May 27, 1920, pp. 504-508, 13 figs. Modern method of manufacturing tin cans, it is pointed out, requires machinery that is practically automatic in every detail of its operation, so that once adjusted for certain size of container, sequence of production while process is in progress is absolutely continuous. Notes on manufacture of the soldered can and the sanitary can.

CANTEENS

See BUILDINGS, Concrete.

CANTONMENTS

See ARMY CAMPS.

CAPACITY

Measurement. A Differential Arrangement for the Measurement of Capacities and Self-Inductions with a Sensibility of 2×10^{-8} (Eine Differentialschaltung zur Messung von Kapazitäten und Selbstinduktionen mit einer Empfindlichkeit von 2×10^{-8}), G. Falckenberg. Annalen der Physik, vol. 61, no. 2, Jan. 15, 1920, pp. 167-172, 2 figs. Results of experiments with differential arrangements in which undamped oscillations are generated with a Lorentz vacuum tube (type M), with the aid of an arrangement used by the same firm for tube transmitters manufactured by them.

Method for Measuring Very Small Capacities and Inductances (Verfahren zur Messung sehr kleiner Kapazitäten und Induktivitäten), L. Pungs and G. Preuner. Physikalische Zeitschrift, vol. 20, no. 23, Dec. 1, 1919, pp. 543-545, 1 fig. Preliminary tests are said to show that method is practicable for various investigations, for example, for determination of dielectric constants of gases, etc. It is said that this report from the laboratory for wireless telegraphy of the German Navy is to be followed by reports on the refinement of process and corrections.

See also ELECTRICAL MEASUREMENTS, Inductance and Capacity.

CAPSTANS

Electric. Electric Capstans (Elektrische Spille), Annalen für Gewerbe u. Bauwesen, vol. 86, no. 3, Feb. 1, 1920, pp. 21-22, 3 figs. Details of the Demag electric capstans of which standard models are built with tractive force of 200 to 5000 kg. and for three-phase 50-cycle current or direct current.

Electric Capstans for Railway Work. Ry. Gaz., vol. 32, no. 6, Feb. 6, 1920, pp. 195-196, 3 figs. Capstan made by Thomas Broudbent & Sons, Ltd., Huddersfield, England.

CAR AXLES

Development. The Car Axle. Ry. & Locomotive Eng., vol. 32, no. 11, Nov. 1919, pp. 330-332. Its early history and development.

[See also CAR WHEELS, English and American.]

CAR COUPLERS

See CARS, Couplers.

CAR DUMPERS

Electrically Operated. The Coal Harbour of Hampton Roads, F. F. Springer. Colliery Guardian, vol. 118, no. 3077, Dec. 10, 1919, pp. 1639-1641, 6 figs. Details of electrically-operated dumper capable of dumping two 60-ton coal cars in one operation.

Hopper-Bottom Cars vs. Hopper-Bottom Cars vs. Car Dumpers (Selbstentlader oder Kipperbetrieb?), H. Aumund. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 37 and 39, Sept. 11 and 25, 1920, pp. 738-741 and 789-792, 11 figs. Discussion of practice and railroad station equipment in connection therewith, pointing out advantages of latter over former.

Large-Capacity. Linn Mine-Car Dump is Largest in the World, Ralph W. Mayer. Coal Age, vol. 17, no. 22, May 27, 1920, pp. 1085-1088, 10 figs. Dump is nearly 300 ft. long and is operated by compressed air. By it, it is said, 28 cars in single trip may be discharged simultaneously.

Mine-Car, Rotary. Rotary Mine-Car Dumpers, Sheldon Smillie. Coal Age, vol. 17, no. 6, Feb. 5, 1920, pp. 260-263, 6 figs. Advantages claimed for rotary mine-car dumper are that it permits use of gateless door, allows any number of cars to be emptied at once and requires much less labor in operation than do other types of car discharges.

Railway, Large-Size. Rock-Crushing Plant with Large Size Railway Car Dumper. Rock Products, vol. 22, no. 26, Dec. 20, 1919, pp. 24-25, 6 figs. Dumps 50 tons of limestone into big gyratory in one operation.

CAR FLOATS

Concrete. Concrete Floats Meet Hard Test, W. T. Duggan. Mar. Rev., vol. 50, no. 2, Feb. 1920, pp. 88-90, 6 figs. Tests of various floats built for army-transport service and survey of uses of car floats in New York Harbor are said to have demonstrated that working of floats does not set up stresses on steel sufficient to cause fatigue of metal as it would be occasioned on the high seas.

CAR JOURNALS

Brasses, Lining. Lining Engine and Car Journal Brasses, W. J. McGee. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 917-919, 2 figs. Points out long train of bad and costly results from maladjustment of car journals in their boxes and pedestals and from carelessness in applying linings to journal brasses. A jig or mandrel whereby, it is said, this work can be done with assurance as to correctness of results is illustrated. Paper read before Southern & Southwestern Ry. Club.

CAR LIGHTING

Data on. Illumination of Cars is Becoming an Exact Science. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 360-368, 24 figs. Data in regard to efficiency and uniformity of distribution, effect of coloring of head lining, installation, maintenance cost and methods of testing intensity required. Committee report of Assn. Ry. Elec. Engrs.

Equipment, Specifications for. Specifications for Electric Train Lighting Equipment. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 380-383. Suggesting reductions in present practices, which are believed not to impair qualities of service. Committee report of Assn. Ry. Elec. Engrs.

Improved. How Have the Railroads Developed Car Lighting, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 11, no. 4, Apr. 1920, pp. 123-128, 7 figs. Description of some of important improvements developed on Rock Island.

Oerlikon System. Oerlikon Electric System of Train Lighting (Systéme d'éclairage électrique des trains, des ateliers de construction d'Oerlikon). Génie Civil, vol. 76, no. 6, Feb. 7, 1920, pp. 160-161, 1 fig. System combines storage batteries and dynamo operated by belt transmitting power from axle.

Storage Batteries for. Train Lighting Storage Batteries, E. Wanamaker. Ry. Rev., vol. 65, no. 22, Nov. 29, 1919, pp. 791-794. Instructions for their care and operation and discussion of preferred methods of battery protection through use of potential regulators.

CAR WHEELS

Chilled-Iron, Life of. Limiting Features in the Life and Performance of Chilled Iron Wheels. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 755-756, 5 figs. Discussion of effect that braking pressures and mating of wheels have on wheel life together with methods of measuring worn wheels for removal, as given by Assn. of Manufacturers of Chilled Car Wheels.

Chilled-Iron, Manufacture. Manufacturing Chilled Iron Car Wheels, H. E. Diller. Foundry, vol. 48, no. 7, Apr. 1, 1920, pp. 259-265, 5 figs., to no. 12, June 15, 1920. Profusely illustrated serial dealing with history, metallurgy, molding, testing and construction of chilled-iron car wheels; cupola practice and methods of core room; different types of chillers; details of methods of annealing; inspection and testing; and procedure for small wheels.

English and American. Railway Wheels and Axles, T. H. Sanders. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 99-100. Certification of types used in English and American practice, and discussion of tests to which wheels and axles are submitted before acceptance by railway authorities. Paper read before Sheffield Section of Jl. Instn. of Engrs.

Failures. Car Wheels and Cause of Defects, W. F. Tidswell. Official Proc. Car Foremen's Assn., Chicago, nos. 165 and 166, Oct. and Nov. 1919, pp. 39-57, 6 figs. and 17-38 and (discussion) pp. 38-65. Also in Ry. Rev., vol. 65, no. 23, Dec. 6, 1919, pp. 830-831. Failures discussed are sharp or worn flange, shelled out, burnt chill, as result of either sliding or from brake, application, worn tread, worn through chill, chipped flange, chipped rim, etc.

Ingots for. Individual Ingots for Tires and Wheels. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1507-1509, 3 figs. Comparative value of multiple and individual ingots. To secure individual pipeless ingots of uniform composition three conditions are said to be essential: Well-made dead-melted steel, correct ingot mold proportions, and proper carbonaceous material for ingot top.

Manufacture. Manufacture of Car-Wheels at the Sacramento Shops of the Southern Pacific Company. Metal Trades, vol. 11, no. 6, June 1920, pp. 252-253, 2 figs. It is stated that about 108 tons of metal is poured per day, and average daily output is 270 freight-car wheels, ranging in weight from 625 to 700 lb.

Reclamation by Grinding. Economies Possible by Car Wheel Grinding. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 355-358, 3 figs. Practice of various railroads in reclaiming car wheels by grinding, with description of machine developed for grinding mounted car wheels. Cast-iron car wheels with flat spots are reclaimed, it is said, up to 3½ in. long, provided wheel has not made too great a mileage.

Tires. Maintenance of Car Tyres, Arthur Norton. Elec. Ry. & Tramway Jl., vol. 42, no. 1022, May 7, 1920, pp. 186-188, 3 figs. Importance of hardness testing is pointed out and the Johnson hardness testing machine is described and illustrated.

Measurements in Connection with Machining of Car-Wheel Tires (Ueber das Messen bei der Radreifenbearbeitung), O. Jacken. Annalen für Gewerbe u. Bauwesen, vol. 86, no. 3, Feb. 1, 1920, pp. 18-20, 10 figs. Details of devices for measuring outside and inside diameters, for locating seats on axles, and for steady rests on tire lathe, etc., constructed by the Oberschöneweide Machine Factory, Inc.

CARBAMIDE

Decomposition of. The Decomposition of Carbamide in the Presence of Nitric Acid, Tudor Williams Price. Jl. Chem. Soc., vols. 115 &

116, no. 686, Dec. 1919, pp. 1354-1360. Results of experiments are said to show that reaction between carbamide and nitric acid in dilute solution is unimolecular, products consisting entirely of carbon dioxide and ammonium nitrate.

CARBOCOAL

See COKE, Heating and Power; FUELS, Carbocoal; LOCOMOTIVES, Carbocoal for; PULVERIZED COAL, Uses, Future.

CARBON

Activation of. The Activation of Carbon, N. K. Chaney. Chem. Engr., vol. 28, no. 1, Jan. 1920, pp. 19-22. Technical study of method of activation by differential oxidation.

The Activation of Carbon, N. K. Chaney. Can. Chemical Jl., vol. 3, no. 11, Nov. 1919, pp. 372-375. Nature of amorphous carbon as construed from study of defensive methods against toxic gases used in warfare.

CARBON BLACK

Manufacture. Carbon Black—Its Properties and Uses, G. St. J. Perrott and Reinhardt Thiessen. Jl. Indus. & Eng. Chem., vol. 12, no. 4, Apr. 1920, pp. 324-331, 6 figs. Although present process of making carbon black recovers only a few per cent of carbon in gas, no other process in practical operation produces material with similar properties. In view of diminishing supply of natural gas, it is suggested that development work should be directed toward investigation of entirely new methods, such as thermal decomposition of gas or other hydrocarbons of gas in air, or explosion with carbon monoxide, carbon dioxide, oxygen or other mixtures.

Carbon Black, Roy O. Neal. Natural Gas & Gasoline Jl., vol. 14, no. 5, May 1920, pp. 143-145. Its manufacture from natural gas. Results of investigations by Bur. of Mines.

The Channel Process of Making Carbon Black, Roy O. Neal. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 729-734, 12 figs. Details of plant construction.

Natural-Gas Content. Testing Natural Gas for Carbon Black, Roy O. Neal. Chem. & Met. Eng., vol. 22, no. 7, Feb. 25, 1920, pp. 358-359, 3 figs. Description of portable testing apparatus designed by writer.

CARBON DIOXIDE

Adiabatic at High Temperatures. The Adiabatic of CO_2 at High Temperatures (Die Adiabate der Kohlensäure bei hohen Temperaturen), Kurt Neumann. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 41, Oct. 11, 1919, pp. 1002-1007, 3 figs. It is set forth that determination of indicated efficiency of an internal-combustion engine requires calculation of performance of theoretical loss-free engine; and if combustion temperature in this case should lead to dissociation of gases, after burning of charge must take place during expansion. Calculations of adiabatic of CO_2 are presented in tabular form.

CARBON-DIOXIDE RECORDERS

Dynamic. A Carbonic Acid Indicator Without an Absorption Medium (Ein Kohlensäureschreiber ohne Absorptionsmittel), H. Viehoff. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 10, Mar. 6, 1920, pp. 155-157, 4 figs. Describes apparatus with which determination of CO_2 in flue gas can be effected on a purely dynamic basis without aid of a chemical reagent. Tests show it to be a suitable and simple apparatus for control of furnaces and an improved type of automatic CO_2 indicator.

German. A Heat Meter (Heizkraftmesser), Rudolf Barkow. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, no. 6, Feb. 6, 1920, pp. 41-42, 6 figs. Description of the Aci CO_2 recorder designed by Max Arndt, in which castings and piping are substituted for the glass and rubber tubes, spring clamps, etc., making an instrument better adapted for furnace room operation. It can also be used for investigation of other gas mixtures, such as SO_2, chlorine, ammonia, etc.

CARBON STEEL

See STEEL.

CARBONATE ROCKS

Analysis. See SILICATE ROCKS, Analysis.

CARBURETORS

Alba. The Alba Carburetor (Der Alba-Vergaser), Wa. Ostwald. Allgemeine Automobil-Zeitung, vol. 21, no. 33, Aug. 14, 1920, pp. 28-29, 3 figs. Construction details and various interesting features of new carburetor, the lower parts of which revolve freely about its vertical axis and the throttle lever can be locked on both sides in all directions.

All-Year. The All-Year Carburetor, Austin Parker. Sci. Am., vol. 122, no. 8, Feb. 21, 1920, pp. 189 and 205. Has device for heating mixture.

Altitude Tests. Carbureting Conditions Characteristic of Aircraft Engines, Percival S. Tice. Aerial Age, vol. 10, no. 14, Jan. 19, 1920, pp. 536-537 and 544, 9 figs. Results of tests at altitude laboratory of Bureau of Standards. It was concluded that mixture ratio, air-fuel, should be constant at all pressure levels, for maximum power at all levels; that change in viscosity of fuel with temperature change may be important in metering characteristic of carburetor; that unwarrantable waste of fuel invariably takes place in carburetors not fully corrected for barometric changes; and that heating of mixture causes loss in power output accompanied by increase in specific consumption of fuel.

Beemac. The Beemac Carburetter. Autocar, vol. 44, no. 1272, Mar. 6, 1920, pp. 431-432, 2 figs. Device has three jets automatically and progressively controlled by sliding piston valve.

The Beemac Carburetter. Motor Traction, vol. 29, no. 768, Nov. 19, 1919, p. 465. Constructed with throttle barrel, jet chamber, and float chamber in one unit. It is governed by sliding valve which is operated by suction of engine.

Bloc-Tube. The Bloc-Tube Carburetor. Flight, vol. 11, no. 51, Dec. 18, 1919, pp. 1631-1632, 4 figs. Apparatus insures, it is said, continuous flow of gasoline from tank to engine and that final aperture through which gasoline must pass is kept free from any possibility of being choked by particles of dirt or foreign matter.

Bureau of Standards Test Plant. The Bureau of Standards Carburetor Test Plant, Percival S. Tice. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 439-442, 8 figs. Plant was designed and built for purpose of insuring greater precision and speed in observations of carburetor metering characteristics. Description of several units of plant is given.

Carburetion. Carburetion as Applied to the Design of Automobile Engines, E. S. MacPherson. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1348-1350, 12 figs. Theory of liquid fuel distribution phenomena.

Claudel. Claudel Carburetor Now Made in America. Aerial Age, vol. 11, no. 10, May 17, 1920, pp. 323-324 and p. 339, 7 figs. Plain-tube

automatic compensating carburetors without moving parts. Gasoline is broken up by swift current of air, and emulsion is made inside jet itself before delivery to carburetor proper.

European Carbureter Is Being Manufactured in This Country. Automotive Industries, vol. 42, no. 23, June 3, 1920, pp. 1248-1249, 3 figs. Brief description of Claudel carbureter, feature of which is that variations in power or consumption curve can be effected by changing size and position of compensating holes in diffuser walls.

The Claudel Carburetor. Aviation, vol. 8, no. 8, May 15, 1920, pp. 324-326, 7 figs. Tube automatic compensating carburetor without moving parts.

Cold-Weather. Trouble Saving Accessories. Autocar, vol. 44, no. 1282, May 15, 1920, pp. 902-904, 5 figs. Details of a carburetor for easy starting in cold weather, a sparking plug that can be taken apart for cleaning, a jack that can be used without bending down, and an unpuncturable tire.

Eureka. The Eureka Carburetor (Le carburateur Eureka). La vie automobile, vol. 16, no. 706, May 25, 1920, pp. 213-214, 4 figs. Jets of gasoline and air flow from opposite directions into "emulsion" chamber, where they mix before passing into cylinder.

Feroldi. The Feroldi Carburetter. Autocar, vol. 44, no. 1283, May 22, 1920, p. 959. Description of an Italian automatic instrument of simple construction, consisting of a large float chamber fed from bottom through filter, having on one side a horizontal body with enlarged gauze-covered mouth at one end, a plain orifice for attachment to inlet port at other.

Gasoline-Kerosene. A Petrol-Paraffin Carburetter. Autocar, vol. 45, no. 1291, July 17, 1920, p. 102, 1 fig. Description of instrument which supplies engine with two separate fuels at same time.

Grace. A New Type of Carburetter. Engr., vol. 129, no. 3364, June 18, 1920, p. 620, 6 figs. Patented device said to permit varying strength of mixture over a wide range from control within reach of driving seat. When air-fuel ratio has been once set at any desired value by means of this control, proportionality is claimed to be maintained constant at all throttle openings.

Hammond. The Hammond Carburetter. Autocar, vol. 44, no. 1271, Feb. 28, 1920, p. 377, 1 fig. Float is dispensed with. Supply of gasoline is regulated by needle valve which is actuated by suction of engine.

Hawxhurst. The Hawxhurst Baro-Thermo Carburetter. Autocar, vol. 43, no. 1262, Dec. 27, 1919, pp. 1197, 1 fig. Automatic variation of gasoline level is effected by means of exhaustion of celluloid float and jet is raised by rack and pinion gear.

Heavy Fuel. A New Heavy-Oil Carburetor (Ein neuer Schweröl-Vergaser). Motorwagen, vol. 23, no. 7, Mar. 10, 1920, p. 139, 1 fig. Type in which air is brought to a very high temperature through a steel tube nest (heated by exhaust gases) and then transmitted by tube to carburetor.

A Study in Charge Proportioning with Heavy Fuels, P. S. Tice. Automotive Industries, vol. 43, no. 6, Aug. 5, 1920, pp. 266-269, 6 figs. Tests with Hinkley engine and heavy-fuel carburetor. Theoretical considerations underlying carburetor operation and means required to meet them under varying conditions of throttling and climate.

Kerosene. A New Kerosene Carburetor. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, p. 561, 1 fig. Kjellberg carburetor. Kerosene is mixed with portion of air required for combustion and mixture heated by exhaust heat. Further on toward inlet valves extra air is added.

Low-Grade-Fuel. Carburetion and Distribution of Low-Grade Fuels, O. H. Ensign. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 19-24 and 50, 11 figs. Carburetor is described which is said to produce a mixture which meets theoretical conditions of operation under throttle control with economy and flexibility. Principle involved for metering fuel and air in carburetor is drop in pressure that occurs at center of whirling mass of fluid.

Metering Characteristics. Metering Characteristics of Carburetors, Percival S. Tice and H. C. Dickinson. Nat. Advisory Committee for Aeronautics, no. 49, 1919, 55 pp., 46 figs. Among results found in experimental tests are: Control of range of mixture ratios delivered by carburetor is obtainable by simple selection of ratio of length to diameter for fuel metering passage; coefficient of discharge has almost constant value for throat velocities greater than 145 ft. per second; effect upon carburetor capacity of usual rates and amplitudes is practically negligible; mixture ratio for maximum power is practically constant at all air densities; and ordinarily employed variations in structure and in method of fuel control in carburetors effect inappreciable modifications of altimetric compensation.

Mixture-Ratio Tests. Saving Fuel with the Carburetor, W. E. Lay. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 188-189, 2 figs. Mixture-ratio tests made at University of Michigan. Various carburetor operating conditions.

Preheating and Atomizing in. Preheating and Atomizing in Carburetors (Etude du réchauffage et de la pulvérisation dans les carburateurs). M. Carbonaro. Génie Civil, vol. 76, nos. 4 and 5, Jan. 24 and 31, 1920, pp. 93-97, 6 figs. and 119-121, 6 figs. Influence of these processes upon condition of mixture at moment of admission into cylinder. It is concluded that preheating has no action except in case of very long piping and in case of motors running at very low speeds; in all cases improvement due to preheating is calculated never to exceed 40 per cent. Advantages of atomization over preheating are pointed out.

Saundear. The Saundear Carburetter. Autocar, vol. 43, no. 1262, Dec. 27, 1919, p. 1199, 3 figs. Apparatus has no float chamber and fuel passing through jet is controlled entirely by valves near choke tube of instrument itself.

Variable-Air-Pressure Type. Controlling and Atomizing Fuel by Variable Engine Pressures, John G. Willet. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 51-55, 5 figs. Carburetor designed by writer, in which fuel is controlled and atomized by variable air pressure supplied by engine-driven compressor of standard tire-pump dimensions capable of giving maximum pressure of 15 lb. per sq. in.

Water-Separator. The Cox Atmos Petrol-Water Separator. Autocar, vol. 44, no. 1282, May 15, 1920, p. 898, 2 figs. Description and illustrations of a device to prevent water and foreign matter from passing from main fuel tank into carburetor.

CARBURIZATION

Copper Plating and Depth of. The Effect of Depth of Copper Plating on Carburization, F. P. Zimmerli. Mech. Eng., vol. 42, no. 10, Oct. 1920, pp. 565-566 and p. 602, 6 figs. Experimental determination of least amount of copper which must be plated on piece of steel in order that within specified time no carbon shall have penetrated through coating and gone into

steel. It was found that the depth of copper plating for ordinary work need not be over 0.0002 in., or with 100 per cent safety factor, 0.0004 in., and it is believed that very often lesser thickness would be sufficient.

CARBURIZING

See CASE-HARDENING.

CARDAN SHAFTS

See AUTOMOBILES, Transmissions.

CARGO HANDLING

See TERMINALS, MARINE, Cargo Handling.

CARGO SHIPS

See SHIPS, Cargo.

CARS

Adjustable-Gage. Design Developed by Swiss Industrial Society of Neuhausen for Adapting Wheels of Railway Cars to Different Track Gages (Dispositif de la Société industrielle suisse de Neuhausen, pour faire varier l'écartement des roues de wagons). Génie Civil, vol. 75, no. 23, Dec. 6, 1919, pp. 578-579, 1 fig. In order to separate wheels or bring them closer together car is run over special length of track rails of which are inclined to direction of travel and in center of which rack engages with small gear-operating mechanism separating wheels or bringing them together.

Axles. See CAR AXLES.

Boarding, for Lumber Camps. Boarding Cars for Lumber Camps. Ry. Rev., vol. 67, no. 2, July 10, 1920, pp. 39-42, 12 figs. Humbrid Lumber Co., Sandpoint, Idaho, has for boarding of its workmen, three complete trains of camp cars, 37 in all, comprising kitchen, sleeping, commissary, office and dining cars, which are steam heated, electric lighted, etc.

Brake-Shoe Wear. Unevenly Worn Brake Shoes, Cause and Effect, E. A. LeBeau. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 909-911. Analysis of some of conditions tending to faulty brake gear condition and performance. Paper read before Car Foremen's Assn. of St. Louis.

Buffer. The Buffer Car (Der Schutzwagen), J. Jahn. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 2, Jan. 15, 1920, pp. 19-25, 3 figs. It is suggested that for trains which change their direction en route or travel back and forth over a section without changing their make-up and without being split up in meantime, the regulations for putting on a buffer car should be modified, and reasons therefor are given.

Cabooses. Approved Standard Design for Caboose Cars. Ry. Age, vol. 67, no. 25, Dec. 19, 1919, pp. 1187-1189, 6 figs. Design is 24-ft. caboose of composite type having steel underframe and superstructure with wood outside sheeting and interior finish.

U. S. R. A. Standard Caboose Car. Ry. Mech. Engr., vol. 93, no. 11, Nov. 1919, pp. 654-656, 6 figs. Design recommended by Railroad Administration; strong underframe for heavy pusher service.

Car Dumpers. See CAR DUMPERS.

Car Wheels. See CAR WHEELS.

Chinese. General Characteristics of Chinese Rolling Stock, Frank Rhea. Ry. Mech. Engr., vol. 93, no. 10, Oct. 1919, pp. 585-586, 3 figs. From report no. 80 of Bureau of Foreign and Domestic Commerce, Department of Commerce.

Concrete. See CARS, FREIGHT, Concrete.

Couplers. Automatic +GF+ Coupling for Railway Cars (Selbsttätige +GF+ Kupplung für Eisenbahnfahrzeuge), W. Künzli. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 9-10, May 15, 1920, pp. 107-110, 22 figs. Describes coupling constructed by the Iron & Steel Works Corp., Schaffhausen, and widely used by Swiss roads.

The Type "D" Coupler in Passenger Service. Ry. Age, vol. 69, no. 7, Aug. 13, 1920, pp. 285-287, 2 figs. Also in Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 521-522, 2 figs. Difficulties involved in its application. How problem was solved on new Pullman cars.

Weldless Steel Couplings for Railway Vehicles. Ry. Gaz., vol. 32, no. 3, Jan. 16, 1920, pp. 91-92, 2 figs. Tests carried out by David Kirkaldy & Sons at their works in London are said to have demonstrated advantage of employing weldless steel instead of welded wrought-iron couplings.

Dining. New Steel Dining Cars for the North British Railway. Ry. Gaz., vol. 31, no. 19, Nov. 7, 1919, pp. 592-595, 8 figs. Principal dimensions are: Length over body 66 ft.; width outside body, 9 ft.; height to top of roof from rail, 12 ft. 4 in.; approximate total weight loaded, 45 tons.

Dump. The Economic Disposal of Waste Material, Howard L. Beach. Off. Proc. Ry. Club Pittsburgh, vol. 18, no. 7, Sept. 25, 1919, pp. 183-197 and (discussion) pp. 198-204, 4 figs. Illustrating various types of dump cars.

Dynamometer. See DYNAMOMETER CARS.

Electric, All-Metal. All-Metal Electric Multiple-Unit Cars, Robert C. Thayer. Ry. Mech. Engr., vol. 94, no. 2, Feb. 1920, pp. 81-82, 25 figs. Also Ry. Age, vol. 68, no. 8, Feb. 20, 1920, pp. 549-554, 11 figs. Type built by Lancashire & Yorkshire Railway, England. Aluminum is extensively used and weight of car has been reduced 1623 lbs.

Electric, Safety Type. Electric Railway Service with the Safety Type Car, E. A. Palmer. Proc. Pacific Ry. Club, vol. 3, no. 5, Aug. 1919, pp. 7-11. Operating data of several electric companies in California.

Flexible-Axled, Curve Resistance. Behavior of Free Flexible Axles in Railway Cars on Curves (Das Verhalten der freien Lenkachsen bei der Bewegung der Eisenbahnwagen in Gleisbogen), Chr. Boedecker. Zentralblatt der Bauverwaltung, vol. 39, no. 62, July 30, 1919, pp. 361-366, 9 figs. Calculation of resistance values.

Freight. See CARS, FREIGHT.

Hand, Accidents Caused by. Accidents Caused by Hand and Motor Cars, J. L. Walsh. Ry. Signal Engr., vol. 12, no. 11, Nov. 1919, pp. 391-393, 1 fig. Importance of proper inspection and repair is emphasized and it is suggested that rules governing this class of operation be more generally enforced. Paper read before Eighth Annual Safety Congress.

Hose Connector, Automatic. The Automatic Hose Connector. Ry. & Locomotive Eng., vol. 33, no. 6, June 1920, pp. 174-175. Suggestions as to points to be considered in connection with adoption of a connector, which would probably have already been in universal use, it is maintained, had working at hose coupling beneath cars been but a trifle more hazardous than it is.

Inspection. Inspecting Cars in Interchange. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 722-724. Suggested manner of procedure.

Journal Boxes. Standard Method of Packing Journal Boxes. Ry. Age, Daily Edition, vol. 68, no. 24, June 15, 1920, pp. 1807-1809, 1 fig. Method recommended by Committee of Am. Railroad Assn., Mech. Section.

Lighting. See CAR LIGHTING.

Mine. Cars Without End Gates Can Now Be

Used on Self-Dumping Cages, Arthur M. Simpson. Coal Age, vol. 18, no. 6, Aug. 5, 1920, pp. 283-285, 4 figs. It is claimed that solid-body mine cars possess many advantages over those of endgate type. Cage is described that is said to discharge these cars more quickly and with less degradation of coal than old-style cage.

Notes on a New Type of Colliery Tram, W. D. Woolley. Proc. South Wales Inst. of Engrs., vol. 36, no. 1, July 16, 1920, pp. 165-177, 10 figs. Frame of new design is of oak instead of pitch pine as in the older design and Rowbotham wheels are used instead of fixed wheels.

Special Cars at Illinois Mine Promote Safety and Aid Operation, Donald J. Baker. Coal Age, vol. 18, no. 5, July 29, 1920, pp. 223-225, 6 figs. Powder cars, hay cars, sprinkler, etc., all specially designed for each purpose.

Oscillations on Curves. Recommendations for the Mitigation of Detrimental Oscillations of Railroad Cars on Curves (Gedanken und Vorschläge zur Milderung der nachteiligen Schwankungen der Eisenbahnfahrzeuge in den Gleiskrummungen), G. Maas. Annalen für Gewerbe u. Bauwesen, vol. 85, no. 12, Dec. 15, 1919, pp. 98-100, 5 figs. Description and illustrations of a car so constructed that when rounding a curve the axles assume position of radii to the curve.

Painting. Paint Pipe Lines in a Cuban Car Shop, J. P. Risque. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 155-157, 4 figs. Device for mixing and spraying used by United Railways of Havana. It is said that with this device 40 coal cars are completely painted in 3½ hours.

Passenger. See CARS, PASSENGER.

Pipe Connectors, Automatic. The Beahm Automatic Connector for Train Pipes. Ry. Age, vol. 69, no. 11, Sept. 10, 1920, pp. 451-453, 5 figs. Connector differs from other types in gathering arrangement, in method of attachment to coupler and in means employed for coupling to cars not equipped with connectors.

The Beahm Automatic Train Pipe Connector. Ry. Mech. Engr., vol. 94, no. 9, Sept. 1920, pp. 585-586, 5 figs. Principal features are pin and funnel aligning device and provision for coupling to air and steam hose.

Postal. New Traveling Post-Offices. Engineer, vol. 128, no. 3338, Dec. 19, 1919, pp. 610-611, 7 figs. Dimensions and features of postoffice railway cars used in various English railways.

Quarry. Cars for Quarries, Daniel J. Hauer. Cement, Mill & Quarry, vol. 15, no. 10, Nov. 20, 1919, pp. 19-20, 2 figs. Types adopted for quarries for producing crushed stone.

Railway Testing. See RAILWAYS, Testing Cars.

Refrigerator. See CARS, REFRIGERATOR.

Repairs. Car Repairs at Elizabethport Shops. Ry. Mech. Engr., vol. 94, no. 7, July 1920, pp. 459-462, 10 figs. Describes work done at principal plant on Central Railroad of New Jersey.

Spreader. A New All-Steel Spreader Car. Ry. Maintenance Engr., vol. 15, no. 12, Dec. 1919, pp. 457-458, 5 figs. Designed to plow material from between rails to either or both sides to depth of 2½ in. below top of rail and to spread it at either side for maximum distance of 24 ft. from center of track.

All Steel Spreader Plow Embodies New Feature. Ry. Age, vol. 67, no. 23, Dec. 5, 1919, pp. 1119-1120, 5 figs. Designed to plow material from between rails to either or both sides to depth of 2½ in. below top of rail and to spread it to either side to maximum distance of 22½ ft. from center of track.

Stock, Convertible. A Convertible Stock Car. Ry. Mech. Engr., vol. 93, no. 11, Nov. 1919, pp. 679-680, 4 figs.; also in Ry. Age, vol. 67, no. 22, Dec. 12, 1919, pp. 1065-1066, 4 figs. Device designed to convert ordinary live stock car into box car for general merchandise purposes.

Street-Railway. See STREET RAILWAYS, Cars.

Tank. See CARS, TANK.

Unloading. The Unloading of Railroad Cars (Zur Frage der Entladung der Eisenbahnwagen), Hubert Hermanns. Braunkohle, vol. 18, nos. 43 and 45, Jan. 24 and Feb. 7, 1920, pp. 555-559 and 592-597, 15 figs. Details and illustrations of unloading by hand, with automatic grab buckets, with tipping wagons, and of elevator scoops with conveyor worm.

CARS, FREIGHT

Ammunition, English. British Railway Workshops in War Time. Engr., vol. 129, no. 3356, April 23, 1920, pp. 430-432, 11 figs. Stages in manufacture of limber hooks, coupling links and hinges for munition cars at Stratford works of Great Eastern works.

Box. Forty-Ton Box Cars for the Cuba Railroad. Ry. Age, vol. 69, no. 4, July 23, 1920, pp. 141-142, 6 figs. Single sheathed steel frame equipment notable for exceptionally strong construction.

British. New Freight Rolling-Stock for British Railways. Ry. Gaz., vol. 33, no. 6, Aug. 6, 1920, pp. 186-189, 6 figs. Recently constructed covered vans and brake vans for Great Eastern and Caledonian Railways built by Clayton Wagons, Limited, of Lincoln.

Concrete. Construction of the First Reinforced-Concrete Car in Austria (Bau des ersten Kohlenwagens aus Eisenbeton in Oesterreich), Walter Stross. Beton u. Eisen, vol. 19, no. 4-5 and 6, Mar. 4 and Apr. 8, 1920, pp. 52-54 and 75, 6 figs. Deals with determination of forces acting and calculations involved; connection of reinforced-concrete underframe with running gear, and maintaining prescribed weight. Results of tests of car under overload are said to demonstrate its practical value.

Cuba Railway. Box Cars for the Cuba Railroad. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 523-525, 7 figs. Cars are of single-sheathed type with steel underframes and steel superstructure. Nominal capacity, 80,247 lb.; length over end sills, 38 ft. 0 in.; light weight, approximately 40,000 lb.

Double Bolster. The Double Bolster Wagon. Ry. Gaz., vol. 32, no. 20, May 14, 1920, pp. 721-722. Type which can be used either as 12-ton ordinary freight car or as double bolster.

Draft-Gear Tests. Draft Gear Tests, U.S.R.A.—Design, Nature and Scope. Ry. Rev., vol. 67, nos. 11, 12, 14 and 16, Sept. 11, 18 and 25, Oct. 2 and 16, 1920, pp. 383-386, 425-429, 3 figs., 461-464, 4 figs., 506-510, 4 figs., and 582-584. Sept.: Action and comparative merits of various gears from viewpoint of impact and buffing. Discussion of developments noted in rivet shearing and impact tests; Oct.: Charts of impact tests made at plant of Symington Co. at Rochester, N. Y. Presents conclusions as to possibilities of testing by car impact method, conception of principles of draft gear action deduced from tests, and recommendations for guidance of possible future activities in pursuing this line of work to more definite conclusion. Report of tests on draft gears made by inspection and test section of U. S. Railroad Administration.

Equipment, Inspection of. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 149-152. Defects of couplers and related parts are summarized and federal requirements for safety appliances are mentioned.

Frame Bracing. Diagonal Frame Bracing of Freight Cars. Ry. & Locomotive Eng., vol. 32, no. 10, Oct. 1919, pp. 306-308, 7 figs. Arguments in behalf of each of two methods—(1) running braces from junction of end and center sills out to end of bolster, and (2) running braces from corner of car into junction of center sills with bolster.

Hartend General Service Type. Hartend General Service Car, and Hart Door Gear. Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 51-52, 2 figs. Between bolster and end sill at either end floor plates are sloped downwardly and outwardly from center sill, thus forming hopper at each corner of car. Outer sides of these hoppers are closed by swinging doors hinged at top and closed and locked by hand.

Inspection of. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, nos. 2, 4, 5 and 7, Feb., Apr., May and July 1920. pp. 93-96, 2 figs., 216-220, 285-288 and 63-468, 1 fig. Feb.: Defects that must be avoided in selection of freight cars for certain commodities; Apr.: Classification of defects to be reported by federal inspectors, also specification covering installation of air-brake equipment on freight cars; May: Air brakes and foundation brake rigging; estimated braking power; defects of arch bars and trucks. July: Handling and testing tank cars.

Maintenance. Economics of Freight Car Maintenance, L. K. Sillcox. Ry. Rev., vol. 65, no. 19, Nov. 8, 1919, pp. 682-685. Also in Ry. Age, vol. 67, no. 26, Dec. 26, 1919, pp. 1227-1231, 1 fig. Value of retirement program, as drastic as conditions will permit, is emphasized particularly, as it may be instrumental in keeping weakly constructed cars out of heavy trains in main line service.

Number Needed Before 1923. Production Is Limited by Lack of Freight Cars. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 27-32, 3 figs. Writer notes that equipment has not kept pace with growth of traffic. He believes that 800,000 cars will be needed in next three years.

24,500 Passenger Cars Needed in Next Three Years. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 37-40, 2 figs. Is based on past record in 10 years up to June 30, 1915, in which time it is said passenger traffic increased 48 per cent and number of passenger cars increased 35 per cent.

Repairing. Freight Car Repairs on the E. P. & S. W., A. M. Dow. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 281-284, 11 figs. Outline of policies followed by El Paso & Southwestern Railway.

Roofs. Freight Car Roofs, H. R. Naylor. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 911-912. Brief description of various types of car roofs and discussion of conditions and qualities that must be provided for in applying roofs to modern house type cars. Paper read before Can. Ry. Club.

Utilization. Freight Car Utilization, Warren C. Kendall. Official Proc. N. Y. Railroad Club, vol. 29, no. 9, Oct. 17, 1919, pp. 5721-5736 and (discussion) pp. 5736-5750. How railroad, shipper and consignee may coöperate to increase capacity and proper working of a freight car.

CARS, PASSENGER

British Railways. New Cars for the "Bakerloo" Line. Elec. Ry. Jl., vol. 56, no. 1, July 3, 1920, pp. 4-7, 8 figs. Train for joint operation over lines of London (England) Electric and London & Northwestern Railways.

Canadian National Railways. New Sleeping Cars, Canadian National Rys. Ry. Rev., vol. 66, no. 13, March 27, 1920, pp. 511-512, 4 figs. Cars are specially insulated in consideration of extreme weather conditions under which they will operate.

Coupler for. See CARS, Couplers.

Foundation Brake Rigging. Foundation Brake Rigging—Passenger Cars, William Schriver, Official Proc. Car Foremen's Assn. Chicago, vol. 15, no. 4, Jan. 1920. Recommends frequent inspection and adjustment of foundation brake rigging and uniform maintained piston travel of 8 in.

Lighting. See CAR LIGHTING.

London Subway. New Electric Cars Built for British Line, Frederick C. Coleman. Ry. Mech. Engr., vol. 94, no. 4, April 1920, pp. 211-213, 5 figs. Passenger cars of Metropolitan Railway of London designed with five side doors for reducing stopping time at stations.

New Passenger Car on the Metropolitan Railway. Ry. Gaz., vol. 32, no. 1, Jan. 2, 1920, pp. 21-24, 5 figs. Provided with five swing doors on each side and accommodation of 58 seats.

Pullman Sleepers. Improvements in New Pullman Sleepers. Ry Mech. Engr., vol. 94, no. 9, Sept. 1920, pp. 589-592, 8 figs. Changes in details which have been developed to add to comfort and safety of travel.

CARS, REFRIGERATOR

Comparative Tests. Comparative Tests of Refrigerator Cars. Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 28-32, 5 figs. Temperature readings in actual service on cars equipped with overhead and end ice bunkers.

C. P. Ry. Canadian Pacific Railway Steel Underframe Refrigerator Cars. Can. Ry. & Mar. World, no. 261, Nov. 1919, pp. 585-586, 1 fig. Particulars of 41-ft. cars.

Refrigerator Cars for the C. P. R. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 713-716, 4 figs. Steel underframe construction, 41 ft. long, fitted with tank bunkers, meat racks and ventilators.

The Canadian Pacific Builds Refrigerator Cars. Ry. Age, vol. 67, no. 22, Nov. 28, 1919, pp. 1041-1044, 5 figs. Equipped with tank bunkers, meat racks and ventilators; steel underframe construction, 41 ft. long.

Gas-Eliminating System. Refrigerator Car Gas Eliminating System. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 545-546, 1 fig. Function of system is to remove from atmosphere of refrigerator the gases produced by bacterial action in breaking down of tissues of product under refrigeration, and it is designed for use with any cooling system. System has been developed and is now controlled by Acme Refrigerator Corporation, Chicago.

Overhead vs. End Ice Bunkers. Overhead vs. End Ice Bunkers in Transit Refrigeration. Ry. Rev., vol. 65, no. 24, Dec. 13, 1919, pp. 875-877, 3 figs. Overhead system found preferable.

Refrigeration Test Conducted with Fruit Laden Cars. Ry. Age, vol. 68, no. 9, Feb. 27, 1920, pp. 631-635, 5 figs. Comparative temperatures with overhead and end ice bunkers.

Standard Type. The Development of a Standard Refrigerator Car, M. E. Pennington. A.S.R.E. Jl., vol. 6, no. 1, July 1919, pp. 1-12 and (discussion), pp. 12-24, 7 figs. Essentials laid down by Railroad Administration Mechanical Department Circular No. 7.

CARS, STREET

See STREET RAILWAYS, Cars.

CARS, TANK

English. Railway Tank Wagon for the Conveyance of Ammonium Nitrate. Engr., vol. 129, no. 3346, Feb. 13, 1920, pp. 176-177, 4 figs. Tank has six-inch taper in length in order to permit contents to leave without any difficulty when tipped underways.

Maintenance. Tank Car Maintenance. Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 361-362. Importance of proper repairs of friction draft gears.

Unloading. Rules for Unloading Tank Cars of Inflammable Liquids. Oildom, vol. 11, no. 10, Oct. 1920, p. 13. Instruction for unloading tank cars of inflammable liquids, embodying modifications suggested by petroleum industry in response to American Petroleum Inst.'s circulars containing tentative draft.

Wrecks and Derailments, Handling. Handling Wrecks and Derailments Involving Loaded Tank Cars, W. S. Topping. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 157-158. Rules are formulated for safely handling wrecks while tank cars are leaking gasoline copiously, or gasoline which has already escaped in quantity is still uncared for.

CARTOGRAPHY

See MAPPING.

CASE-HARDENING

Calcium Cyanide in. Heat Treating Methods Improved in 1919, B. F. Weston. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 113-114. Notably by use of calcium cyanamide in case-hardening.

Carburizers. Carburizers and Carburizing Furnaces, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 146-155, 3 figs. Instructions on manner of using carburizers.

Faults in. Faults in Case Hardening, H. Ensaw. Machy. (Lond.), vol. 15, no. 373, Nov. 20, 1919, pp. 233-234. In considering various points raised it should be remembered, writer says, that it is possible, occasionally, for the enormous stresses which are set up during contraction, on quenching, to cause rupture even when material and thermal treatment have been properly attended to.

Gas Furnace for. City Gas as a Case-hardening Agent, H. M. Crawford. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 386-388, 3 figs. Results of carburizing low-carbon steel for seven hours in illuminating gas at various temperatures. Sketch of gas-carburizing furnace.

Heat-Resisting Alloys for. Heat Resisting Alloys for Case Carburizing, H. H. Harris. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 446-448, 5 figs. Composition and manufacture of heat-resisting alloys. Boxes for case carbonizing, cyaniding and drawing and suggestions to be remembered in making selection.

Improvement in. Improvements in the Case-Hardening Process, D. Hanson and J. E. Hurst. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 20-24 and 38-49, 6 figs. Experimental. It was found that ordinary methods of case hardening at or above 900 deg. cent. tend to lead to formation of hyper-eutectoid layer in the case, which is frequent source of flaking and grinding cracks.

Methods. Carburizing and Casehardening, S. P. Rockwell. Machy. (N. Y.), vol. 26, nos. 5 and 7, Jan. and Mar. 1920, pp. 387-395, 7 figs. and 627-632, 4 figs. Practice in carburizing and casehardening with notes on different classes of carburizers, their selection and characteristics. Description of four methods of treating work after it has been carburized, namely, (1) pot quenching, (2) pot cooling and single quenching, (3) pot quenching and single cooling, and (4) pot cooling and double quenching.

Carburizing and Case-Hardening. Machy. (Lond.), vol. 15, no. 390, March 18, 1920, pp. 773-777, 9 figs. Methods of determining depth of carburization, of protecting portions of work in local carburizing, and of cleaning carburizers after use.

The Casehardening of Steel, J. F. Springer. Ry. Mech. Engr., vol. 93, nos. 11 and 12, Nov. and Dec. 1919, pp. 675-676 and 731-735, 1 fig. Nov.: Methods employed. Importance of proper packing and control of temperature; Dec.: Chart showing relation of time and temperature to depth of impregnation.

Rules for. Practical Casehardening, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 460-465. It is emphasized that no matter what method of operation is employed, "the man is more than the method."

Shimer Process. A Practical Talk on Some Modern Methods of Heat-Treatment, John E. Halbing and Frank Shepherd. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, March 1920, pp. 257-278, 12 figs. Various suggestions are given, specially method for heat treating tools made from one per cent straight carbon steel. Analysis is also made of Shimer case-hardening process in which calcium chloride and sodium chloride are used as base and when in molten state calcium cyanamid is immersed to add case hardening properties.

Steel for. The Casehardening of Steel, F. C. A. Lantsberry. Mech. World, vol. 67, no. 1744, June 4, 1920, pp. 355-356. Composition which it is stated has given excellent results in England, with regard to steel used for case-hardening, consists of 15 per cent carbon, 10 per cent silicon, .05 per cent max. sulphur, .06 per cent max. phosphorus and 80 per cent manganese. Main faults of case-hardening are said to be soft spots, general softness, and cracking of case, or exfoliation, each of which is discussed. Paper read before Staffordshire Old Boys' Met. Assn.

Steel. Case Hardening of Steel, Walter Rosenhain. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 74-76, 2 figs. Outline of principles underlying process and discussion of recent improvements in it which overcome tendency for case to crack and fleck off.

See also Methods.

[See also CARBURIZATION.]

CASEIN

Use in Glue Making. See GLUE MAKING, Casein.

CAST IRON

Contraction. Effects of the Contraction of Iron, Ernest Schwartz. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 836-838, 2 figs. Cores which do not break up as casting sets and faulty designs are mentioned among principal causes of cracking of castings due to contraction.

Electric-Furnace Refining. Electric Furnaces and the Sulphur Problem in Cast Iron, George K. Elliott. Iron Age, vol. 106, no. 15, Oct. 7, 1920, pp. 919-920. It is held that electric refining means better castings and less manganese consumption. Very low sulphur is not considered necessary. Paper read before Am. Foundrymen's Assn.

Electric Welding. See ELECTRIC WELDING, ARC, Cast Iron.

Growth of. On the Growth of Grey Cast Iron, Masatosi Ôkôchi and Naosi Satô. Jl. College

of Eng., Tokyo Imperial University, vol. 10, no. 3, Feb. 29, 1920, pp. 53-71, 31 figs. on 8 supp. plates. Account of experiments which are said to have confirmed theory of growth based on pressure of occluded gases.

Hardness. Investigations into the Hardness of Cast Iron at Different Temperatures, M. Leon Guillet. Foundry Trade Jl., vol. 21, no. 215, Nov. 1919, pp. 811-813, 11 figs. Results obtained with various specimens. Translated from Revue de Métallurgie.

Heat Treatment of. Cast Iron Under Heat Influences, E. Adamson. Foundry Trade Jl., vol. 21, no. 215, Nov. 1919, pp. 804-806, 2 figs. Heating and cooling curves of cast iron, showing two chief points of recalescence. Paper read before West of Scotland Iron & Steel Inst.

Iron Carbide in. The Solubility and Stability of Iron Carbide in Cast Iron, J. A. Holden. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 220, April 1920, pp. 270-271, 3 figs. Experiments are related and it is concluded from them that carbide is stable while it is in solid solution even in presence of considerable percentage of silicon.

Oxygen Cutting. Recent Developments in Oxygen Cutting, Stuart Plumley and F. J. Napolitan. Welding Engr., vol. 5, no. 7, July 1920, pp. 25-26. Cast iron can be cut, it is stated, by preheating the oxygen.

Research. Future Research on Cast Iron, J. H. Andrews. Eng. and Indus. Management, vol. 4, no. 13, Sept. 23, 1920, p. 397. Also in Foundry Trade Jl., vol. 22, no. 225, Sept. 1920, pp. 690-691. Points out field of research, such as determination of dilatation curves, electrical resistivity determinations and investigations on cupola slags. From paper read before Annual Conference of Instn. of British Foundrymen.

Silicon, Influence of. Investigation of Silicon Reviewed, T. Turner. Foundry, vol. 48, no. 5, March 1, 1920, pp. 184-186. Highest tensile strength of cast iron has been obtained with 1.8 per cent silicon and hardness has been found to decrease until iron contained approximately 2.5 per cent silicon. Paper read before Coventry branch, Instn. of British Foundrymen.

The Influence of Silicon in Cast Iron. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 218, Feb. 1920, pp. 101-108, 7 figs. Results of various experimenters are quoted. It is noted that bar of pure washed iron contracts uniformly throughout cooling; immediately on addition of 0.23 per cent silicon marked expansion of 80 units becomes evident after solidification, expansion increasing by 160 units to 240 units on formation of graphite.

Stresses in. Study on Stresses in Cast Iron based on various Burdens (Beiträge zur Kenntnis der Spannungen im Grauguss unter Zugrundelegung verschiedener Gattierungen), Otto Banse. Stahl und Eisen, vol. 39, no. 22, May 29, 1919, pp. 596-600, 4 figs. Tests showed that measurements of outer frame parts vary considerably in various burdens. The tests are also said to have shown that next to proper burden dry sand casting is one of means to avoid stresses.

Synthetic. Synthetic Cast Iron, Charles Albert Keller. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 83-88, 2 figs. Also in Eng. & Indus. Management, vol. 2, no. 17, Oct. 23, 1919, pp. 515-520, 4 figs., and Engineering, vol. 108, no. 2810, Nov. 7, 1919, pp. 632-634, 1 fig. Outlines continuous process of rapid carburization during melting of steel turnings, said to produce cast iron and semi-steel of exceptional purity and exact chemical analysis for manufacture of heavy shells and high-grade castings. Novelty of manufacturing is said to consist in carburizing iron and steel scrap and more particularly turnings by melting these materials in presence of carbon which is introduced simultaneously with them in melting appliance. From paper presented to Iron & Steel Inst.

Synthetic Electric Furnace Cast Iron, Ch. A. Keller. Gen. Meeting Am. Electrochem. Soc., Apr. 8-10, paper 2, pp. 17-34, 22 figs. Development in France, during war, of electric-furnace processes for converting steel turnings from munition plants into low-carbon cast iron, high in silicon and low in sulphur and phosphorus, for production of cast-iron shells. Types of furnaces used and how method was varied according as to whether very low sulphur or very low phosphorus, or both, were desired.

Welding. See ELECTRIC WELDING, Cast Iron; OXY-ACETYLENE WELDING, Cast-Iron Repairs.

Zirconium in, Effect of. Effect of Zirconium in Cast Iron, Richard Moldenke. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 968-969. Tests on alloys containing up to 30.6 per cent zirconium. It was noticed that for smaller percentages metal behaved nicely in melting and indicated purifying action, for slags came up and collected for easy removal. Larger percentages gave more trouble and chilled metal considerably so that it was difficult to pour successfully. Paper read before Am. Foundrymen's Assn.

CAST STEEL

See FOUNDRIES, Steel.

CASTERS

Ball-Bearing. Manufacturing Ball Casters. Machy. (London), vol. 16, no. 409, July 29, 1920, pp. 509-513, 15 figs. Quantity production of ball-bearing casters.

CASTING

Centrifugal. The Manufacture of Rotating-Projectile Bands by Centrifugal Casting, Louis J. Josten. Foundry Trade Jl., vol. 22, no. 219, Mar. 1920, pp. 185-188, 3 figs. It is claimed that soundness of casting produced by this process is far superior to that of one made in sand mold "as there is no sand to wash away during pouring, causing sand holes or gases which cannot escape and thus produce blow holes."

CASTINGS

Aluminum. See Metal, Limitations; ALUMINUM, Castings.

Brass. See Metal, Limitations; BRASS, High-Tensile, Castings; BRASS FOUNDING.

Bronze. See BRONZE CASTINGS.

Chilled. Two Interesting Examples of "Reversed Chill Casting" (Ueber zwei interessante Fälle von "umgekehrtem Hartguss"), H. Frei. Giesserei-Zeitung, vol. 17, nos. 7 and 8, Apr. 1 and 15, 1920, pp. 109-112 and 130-133, 21 figs. It is shown that phenomenon of the reversed chilled castings is due to abnormally large sulphur content and that its formation can be prevented by changing method of burdening.

Copper. See COPPER, Castings.

Die. See Metal, Limitations; DIE CASTING.

Iron. See Metal, Limitations; IRON CASTINGS.

Malleable. See Metal, Limitations; MALLEABLE CASTINGS.

Metal, Limitations. Metal Castings. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 427-439 and (discussion), p. 440, 8 figs. Group of papers on usefulness and limitation of various types of castings contributed by A. S. M. E. Sub-Committee on Foundry Practice. Titles of papers

are: Aluminum Castings, by Zay Jeffries; Malleable Castings, by Enrique Touceda; Steel Castings, by John H. Hall; Die Castings, Charles Pack; Brass and Bronze Castings, Christopher H. Bierbaum; Gray-Iron Castings, Richard Moldenke.

Monel Metal. See MONEL METAL.

Non-ferrous. Heat Control in Non-ferrous Melting, John Arnot. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 766-767. Influence exerted by temperature at pouring in quality of non-ferrous castings. British methods of measuring temperature are outlined and instruments described. Paper read before Instn. British Foundrymen.

Patterns for. See PATTERNS.

Production Methods. The Production of Good Iron Castings, Richard Moldenke. Iron Age, vol. 106, no. 6, Aug. 5, 1920, pp. 316-318. Melting Process. Proper height of bed. Effects of improper melting. General principles of gating.

Steel. See Metal, Limitations; STEEL CASTINGS.

CASTOR OIL

See LUBRICATING OILS, Castor Oil.

CATALYSIS

Colloidal Catalyzer. Aging of Colloidal Catalyzers —Platinum, Palladium (Sur le vieillissement des catalyseurs colloidaux, platine, palladium), Gregorio de Rocasolano. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 5, Aug. 2, 1920, pp. 301-303. Experiments are said to have established that such catalyzers increase in activity with age.

Contact. Contact Catalysis, Wilder D. Bancroft. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 16, pp. 233-264. Discussion of present aspects of contact catalysis theory, such as whether catalytic agent can act at distance by radiation, influence of agents which retard reacting substances from reaching catalytic surface, the adsorption explanation of "poisoning" of catalytic agents, etc.

Further Problems in Contact Catalysis, Hugh S. Taylor. Gen. Meeting Am. Electrochem. Soc., paper no. 14, Sept. 26, 1919, pp. 167-173, 1 fig. It is concluded from experiments that admixture of copper with nickel in hydrogenation of oils increases ruggedness of catalytic agent and renders it less sensitive to traces of such negative catalysts as carbon monoxide.

The Thermal Problem in Organic Contact Catalysis, Wilbert J. Huff. Gen. Meeting Am. Electrochem. Soc., paper no. 15, Sept. 26, 1919, pp. 175-194, 6 figs. Specially in cracking of petroleum, and chlorination and hydrogenation of hydrocarbons.

Hydrogenation of Fats. The Mechanism of the Addition of Hydrogen to Unsaturated Glycerides in the Presence of Finely-Divided Nickel, R. Thomas. Jl. Soc. Chem. Industry, vol. 39, no. 2, Jan. 31, 1920, pp. 10T-18T, 4 figs. Equations are derived for rate of addition of hydrogen to mixtures of unsaturated glycerides, using nickel as catalyst. Rôle played by catalyst is discussed from results of experiments on influence of pressure of hydrogen and of temperature on velocity of reaction. Mode of action of "gaseous catalyst poisons" is illustrated and discussed.

Nickel Catalyzer. A New Type of Catalyzer for Hydrogenation, W. D. Richardson. Chem. & Metallurgical Eng., vol. 22, no. 17, April 28, 1920, pp. 793-796. Method of preparing finely divided nickel catalyzer by mechanical grinding.

Overpotential. Overpotential and Catalytic Activity, Eric K. Rideal. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 94-106. It is suggested that overpotential is measure of energy required for desorption of hydrogen from metallic surface.

Petroleum Derivatives. The New Industry of Catalytic Fuels Derived from Petroleum (L'Industrie nouvelle des combustibles catalytiques dérivés du pétrole), A. Mailhe. Chaleur et Industrie, no. 4, July 1920, pp. 199-205. Remarks on cracking process of distillation of petroleum. Uses of compressed catalytic gases.

Precious Metals as Agents. Catalysis by Means of Precious Metals. Scientific Am. Monthly, vol. 2, no. 1, July 1920, pp. 45-46. Use of platinum and palladium in various forms as catalytic agents. (Translated from Génie Civil.)

Promoter Action. Promoter Action in Catalysis, Robert Norton Pease and Hugh Stott Taylor. Jl. Physical Chem., vol. 24, no. 4, April 1920, pp. 241-265, 2 figs. Also in Chem. Trade Jl. & Chem. Engr., vol. 67, no. 1729, July 10, 1920, pp. 37-40, 2 figs. Promoter action in catalysis is defined and distinction is made between two types which have been termed "activation" (of catalyst by substance relatively inert catalytically) and "co-activation" (of two or more catalytically active substances each by the others).

Reactivity. Reactivity and Adsorption in Heterogeneous Catalysis, Eric K. Rideal. Gen. Meeting Am. Electrochem. Soc., paper no. 17, Sept. 26, 1919, pp. 203-211. Expression establishing reaction velocity of reacting system, applied to heterogeneous catalysis.

CATALYSTS

Surface Oxidation of. The Effect of Surface Oxidation on Some Metallic Catalysts, Frank F. Rupert. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 402-411. It was found that catalytic activity of platinum and of palladium toward reaction between hydrogen and oxygen at ordinary temperature in presence of film of water was increased by surface oxidation of metal, whether accomplished by anodic polarization or by chemical means.

[See also NITROGEN, Fixation of.]

CATALYZERS

See FERMENTS.

CATENARY

New Form of. On a New Form of Catenary, J. Hollingworth. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 226, Oct. 1919, pp. 452-463, 2 figs. Aerial trailing an aeroplane.

CATERPILLARS

See TANKS, MILITARY, Caterpillars.

CAUSEWAYS

Miami, Fla. Design of the Miami, Florida, Causeway Across Biscayne Bay, B. H. Klyce. Mun. and County Eng., vol. 59, no. 2, Aug. 1920, pp. 43-44, 2 figs. Embankment is 105 ft. wide and is composed of two parallel walls of creosoted wooden sheet piling and waling tied together with wrought-iron tie rods and filled with sand and rock.

CEILING

See AEROPLANES, Ceiling.

CELLS

Selenium. See SELENIUM, Cells.

CELLULOSE

Constitution of. The Constitution of Cellulose. The Acetolysis of Ethyl Cellulose (Ueber die

Konstitution der Zellulose. Die Acetolyse der Aethylzellulose), Kurt Hess and Walter Wittelsbach. Zeitschrift für Elektrochemie, vol. 26, no. 11-12, June 1, 1920, pp. 232-251. Preliminary report from the Chem. Inst. of the Technical Highschool, Carlsruhe.

CELLULOSE ACETATE

Manufacture of. Manufacture of Cellulose Acetate, Maurice Deschiens. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 533-536, 1 fig. Generalities on cellulose acetates. Esterification. Operating conditions. Industrial manufacture by acetylation of modified or natural cellulose with or without solution of cellulose in esterifying bath.

Properties and Uses. Cellulose Acetate. Chemical Age, vol. 3, no. 56, July 10, 1920, pp. 34-35. Chemical constitution of cellulose acetate, its properties, manufacture and uses.

Properties and Industrial Uses of Cellulose Acetate, Maurice Deschiens. Chem. & Metallurgical Eng., vol. 23, no. 12, Sept. 22, 1920, pp. 581-583, 2 figs. Summarized outline of properties of normal acetate and of its uses in manufacture, especially of dope, celluloid, impermeable fabrics, artificial leather, artificial silk and electric insulation.

CEMENT

Blast-Furnace Slag. See CEMENT, PORTLAND, Blast-Furnace Slag.

Calcium Sulphate, Effect on. The Effect of Calcium Sulphate on Cement, J. C. Witt. Eng. World, vol. 16, no. 2, Jan. 15, 1920, pp. 85-87, 2 figs. Also in Philippine Jl. Sci., vol. 14, no. 2, Feb. 1919, pp. 221-232, 2 figs. Experiments at Chemical Laboratory, Bur. of Sci., Manila. It was found that cement ground in regular way at plant must have sulphuric anhydride content of 1.8 per cent to insure normal set. Effects of exposure to air and of additions of hydrated lime were found to be independent of sulphuric anhydride content.

Fineness, Effect of. Effect of Fineness of Cement, Duff A. Abrams. Bul. 4, Structural Materials Research Laboratory, Dec. 1919, 81 pp., 36 figs. Report covers compression tests on over six thousand 6-in. by 12-in. concrete cylinders, nine thousand compression and tension tests of mortar and several thousand miscellaneous tests. Strength tests of concrete and mortar were made at ages of seven days to one year. Information was secured on effect of fineness of cement under following conditions: (1) Effect of fineness of cement on strength of concrete; (2) quality of concrete using different cements; (3) effect of quantity of cement used; (4) effect of consistency of concrete; (5) effect of size and grading of aggregate; (6) variation in type of aggregate; (7) effect of age of concrete; (8) elongation and contraction of concrete; (9) effect of fineness of cement on workability of concrete. Reprint from Proc. of Am. Soc. for Testing Materials.

Handling in Bulk. Handling and Storing Bulk Cement, Wallace R. Harris. Jl. Western Soc. Engrs., vol. 24, no. 1, Jan. 1919, pp. 21-26 and (discussion), pp. 26-30, 8 figs. Savings effected by handling cement in bulk are pointed out and various schemes for bulk handling of cement are outlined.

Manufacture. See CEMENT MANUFACTURE; CEMENT MILLS.

"Marque Speciale." "Marque Speciale" Swiss Cement, Capt. Henry Pooley. Rock Products, vol. 23, no. 16, July 31, 1920, pp. 24-26. General description of production and product. Cement is of exceptional quality, having a remarkable early strength. It is of uniform quality and plant for its production is not costly to install.

Mills. See CEMENT MILLS.

Mortar. See MORTARS, Cement.

Portland. See CEMENT, PORTLAND.

Products, Improvement of. Improving Cement Products, Norman G. Hough. Nat. Lime Assn., bul. no. 302, 1920, 8 pp. Discussion of properties of various types of cement products; and relation which hydrated lime bears to their development.

Quarrying Rock for. Producing Raw Materials for Portland Cement—XI, Oliver Bowles. Cement, Mill & Quarry, vol. 16, no. 11, June 5, 1920, pp. 13-19. Mixing methods in their relation to quarrying are summarized as follows: Churn-drill and steam-shovel methods of quarrying are in general to be preferred and mixing of quarry materials should be so conducted as to permit their use; mixing may be done by using a number of storage tanks for approximately proportioned mixtures of ground rock, contents of tanks being determined by analyses; final mix is made by drawing off a calculated proportion from three or more tanks.

Storage, Effect of. Effect of Storage of Cement, Duff A. Abrams. Structural Materials Research Laboratory, Lewis Inst., Chicago, bul. 6, June 1920, 29 pp., 10 figs. Tests of effect of storage of portland cement in different kinds of packages and under different conditions on its concrete and mortar-making properties. Compression tests of about 1000 6 by 12 in. concrete cylinders of 1-3 standard sand mortar, and about 500 miscellaneous tests, are included. Among results found were that after 3-months' storage in shed in yard cement had 80 per cent of its original strength; after 6-months' storage, 71 per cent; after 1-year, 61 per cent; and after 2-years, 40 per cent.

Tests Show Effect of Storage on Cement Strength. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1263-1266, 3 figs. Tests were conducted at Structural Materials Research Laboratory of Lewis Institute at Chicago. It was found that all methods of sack storage give initial weakness, but strength becomes near normal in two years.

Strength. Determination of Breaking Strength (Bestimmung der Bruchfestigkeit), R. Grün. Tonindustrie-Zeitung, vol. 43, no. 97, Aug. 19, 1919, pp. 871-872, 2 figs. Writer describes a simple device and process worked out and employed by him for several years before the war, for determining in figures the breaking strength of cement after 24 hours.

Tester, Automatic. A New Type of Automatic Cement Tester, Thorsten Y. Olsen. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 4 pp. 1 fig. Machine resembles ordinary type of automatic shot cement tester, with the one difference that a liquid is used in place of shot.

Testing. Cement Testing Steamer Heated by Electricity, Howard H. George. Eng. News-Rec., vol. 85, no. 1, July 1, 1920, pp. 33-34, 2 figs. Describes home-made apparatus suitable for small laboratory made with special constant water level device.

CEMENT GUN

Applications. Construction Work by Cement Gun Methods, Arthur J. White. Proc. Engrs. Soc. Western Pennsylvania, vol. 36, no. 2, Mar. 1920, pp. 109-130 and (discussion) pp. 131-144, 13 figs. Examples are presented of structures covered with gunite. Among these are rapid transit bridge, Long Island, N. Y., roof of power plant of Ford Motor Co., Detroit, and tanks of Peoples Gas, Light & Coke Co., Chicago. Advantages of covering steel structures with gunite are enumerated.

Covering Mine Buildings. Gunite Forms an Excellent Material for Covering Mine Buildings. Coal Age, vol. 17, no. 24, June 10, 1920, pp. 1185-1188. Frame buildings with gunite covering, it is claimed, are cheaper than cement structures covered with sheathing and clapboards and nearly fire-proof, only the trim requiring repainting.

Gunite. "Gunite" is Proven Highly Fire Resistant, B. C. Collier. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 932-934, 3 figs. Underwriters' tests are said to have indicated that cement gun could be classed as superior fire retardant.

Results of Tests of Strength of Gunite Slabs. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, p. 723, 1 fig. Tables are presented giving summary of tests on gunite slabs, 2 in. thick, 4 ft. clear span; of gunite slabs, simple beam 6 ft. clear span; and gunite slabs of 6 ft. and 8 ft. span.

House Construction. Gunite Walls and Studs for Houses. Concrete, vol. 17, no. 1, July 1920, pp. 9-11, 9 figs. Gunite construction trending toward permanence and fire-proofness and employing minimum of materials—the least bulk and dead weight.

Relining Park Lake. Relining a Leaky Park Lake with Gunite, Donald J. Baker. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 410-411, 2 figs. Mixing plant set up on shore and concrete applied as far as 400 ft. distant. High pressure used.

Slopes, Use on. Effective Use of the Cement Gun, Donald J. Baker. Coal Age, vol. 16, no. 21, Nov. 27, and Dec. 4, 1919, pp. 836-838, 7 figs. Method of applying gunite on slope.

Uses. Cement Gun and Its Uses (Le cement-gun et ses applications générales), M. Bousquet. Vie Technique et Industrielle, vol. 1, nos. 10 and 11, July and Aug. 1920, pp. 294-296 and 399-402, 9 figs. Results of experiments made at experimental laboratory of the Conservatoire national des Arts et Métiers, Paris, France.

CEMENT MANUFACTURE

Accidents. Hazards of Cement Manufacture, R1. Frame. Cement & Eng. News, vol. 31, no. 11, Nov. 1919, pp. 41-42. Study of cases of personal injuries in connection with cement manufacturing said to have disclosed that screw conveyor and sliding materials were always among leading hazards.

See also ACCIDENTS, Shafting and Belt Hazards.

Crushing Rolls. Cure and Upkeep of Crushing Rolls, H. C. Holthoff. Cement, Mill & Quarry, vol. 16, no. 3, Feb. 5, 1920, pp. 61-64, 2 figs. Data and determination of sizes of feed, peripheral speeds and capacities.

Heat and Power Economy. Heat and Power Economy in the Cement Industry (Wärme- und Kraftwirtschaft in der Zementindustrie), O. Büttner. Tonindustrie-Zeitung, vol. 44, no. 27, Mar. 2, 1920, pp. 251-252. Gives data on consumption of heat and power in the cement industry, from which it is shown that with a given quantity of coal, an increase in production of cement can be effected only by use and further development of modern shaft kilns, and states that according to recent investigations, a certain type of ball mill guarantees a minimum consumption of power for pulverizing.

Kiln Insulation. Cement and Lime Kiln Insulation, K. A. Grogan. Cement, Mill & Quarry, vol. 16, no. 8, April 20, 1920, pp. 27-32, 16 figs. Advantages of insulating cement and lime kiln are pointed out, and curves are shown comparing amount of heat lost through kiln crown when insulated and uninsulated. Sil-O-Cel insulating brick is recommended as "highly effective for all classes of insulating service."

Rock for. See QUARRYING, Cement Rock.

Rotary Kilns. Preheating Air for Rotary Kilns, S. H. Harrison. Concrete, Cement Mill Section, vol. 16, no. 1, Jan. 1920, pp. 9-11, 2 figs. Method of calculating theoretical maximum temperature of preheated air under ideal conditions.

State-Owned Plant. Should the State Own and Operate a Plant for the Manufacture of Portland Cement? J. C. Nagle. Good Roads, vol. 20, no. 8, Aug. 25, 1920, pp. 92 and 94-95. State-owned plant, it is claimed, would stabilize market prices and reduce fluctuations.

Waste-Heat Utilization. See WASTE HEAT, Utilization.

Wet Process. Latest Development in Wet Process Portland Cement Plants. Rock Products, vol. 23, no. 1, Jan. 3, 1920, pp. 48-56, 29 figs. Plant at Greencastle, Ind., which is laid out to furnish capacity of 1200 to 1500 bbl. of cement per 24 h.

New Wet Process Plant of the Indiana Portland Cement Co. Concrete, Cement Mill Section, vol. 16, no. 1, Jan. 1920, pp. 1-9, 9 figs. Capacity for plant is 1500 bbl. Storage and mixing tanks, slurry and clinker elevators, hoppers, platforms and machinery supports are of reinforced concrete; piers for kilns and heavy machinery are of massive concrete.

See also CEMENT MILLS, Electrically Operated.

CEMENT MILLS

Electric Drive in. Electrical Equipment of Western Portland Cement Plant. Elec. Rev. (Chicago), vol. 75, no. 20, Nov. 15, 1919, pp. 809-810, 4 figs. Showing application of electric drive in operation of cement mill.

Electrically Operated Cement Plant at Greencastle, Ind., M. C. Turpin. Cement, Mill & Quarry, vol. 16, no. 7, Apr. 5, 1920, pp. 31-34, 7 figs. All machinery of plant, including complete system of conveyors and elevators, is electrically operated and frequently remote controlled, all wiring being encased in metal conduit. Description of wet process employed in manufacture of cement.

Heat Recovery in. The Problem of Waste Heat Recovery in Cement Mills, H. D. Boylor. Cement & Eng. News, vol. 31, no. 11, Nov. 1919, pp. 46-48. Tests of recovery of waste heat in gases of combustion from rotary kiln.

CEMENT MORTAR

See CEMENT, Mortar.

CEMENT, PORTLAND

Blast-Furnace Slag. Iron Portland Cement, with Classification of Cements Made from Blast-Furnace Slag, Edwin H. Lewis. Iron & Steel Inst., Paper 6, Annual Meeting, May 6 and 7, 1920, 10 pp. Cements made from blast-furnace slag are divided into five classes: (1) Blast-furnace slag as cement; (2) slag cements; (3) portland cement; (4) improved slag cement; and (5) iron portland cement. How far iron portland cement can comply with tests required in British standard specification for portland cement is indicated.

Quarrying Rock. See QUARRYING, Cement Rock.

Raw Materials. Analysis of Portland Cement Raw Mixture, J. C. Witt. Cement, Mill and Quarry, vol. 16, no. 5, Mar. 5, 1920, pp. 23-27, 2 figs. Of two classes of methods for determining calcium carbonate content of portland-cement raw mixture, namely those in which calcium is determined and those in which other constituent

is determined, methods of latter class are held to be simpler and more rapid.

Producing Raw Materials for Portland Cement, Oliver Bowles. Cement, Mill & Quarry, vol. 15, no. 11 (Dec. 5, 1919, p. 19), vol. 16, no. 10 (May 20, 1920). Serial, illustrated. Classification of suitable materials. Notes on use of tripod drills, hammer drills, arrangement of churn-drill holes for multiple shots, difficulties encountered in steeply inclined beds, and "gopher-hole" or "tunnel" method of blasting. Types of explosives used in quarrying cement rock. Arrangement of charges in drill holes. Methods employed for rock loading.

Setting Time. Setting Time of Cement as Affected by the Quality of the Water, F. Esling. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, pp. 101-103. Experiments with samples of cement, portions of which were aerated for 14, 24 and 48 hr. before use. Investigation is said to have shown need for greater attention to quality of water employed in preparing cement for testing and also desirability of using distilled water for purpose of testing, so that results may not be obstructed by variations due to presence of chemical substances dissolved in water.

Solubility. The Solubility of Portland Cement.—Its Relation to Theories of Hydration, J. C. Witt and F. D. Reyes. Concrete, Cement Mill Section, vol. 16, no. 1, Jan. 1920, pp. 13-17, 1 fig. Factors that effect solubility were found to be (1) absence of carbon dioxide, (2) method of agitation, (3) fitness of grain, (4) volume of water and (5) time. Of these, volume of water is said to be most important. Investigations at laboratory of General, Inorganic and Physical Chem., Bur. of Sci., Manila, P. I.

Specifications. British Standard Specification for Portland Cement. British Eng. Standards Assn., no. 12, 1920, 18 pp., 6 figs. Specifications approved on Aug. 5, 1920.

Tests. On Long-Time Tests of Portland Cement, Hydraulic Lime, and Volcanic Ashes, I. Hiroi. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 7, June 30, 1920, pp. 155-172, 32 figs. on 10 supp. plates. Tests included study of influence of surrounding bodies on strength of cement and hydraulic lime, influence of qualities of sands used in mortars, strengths of mortars of various proportions in sea-water, effect of curing on strength of mortars, behavior of volcanic ashes as ingredients in cement mortars, effect of ramming on strength of mortars, effect of variation in quantity of water used in mortars, effects of storage and aeration on setting-time and strength of cement, strengths of mortars of various proportions in air, fresh-water, and sea-water, effect of mixing common salt in mortars.

[See also QUARRYING, Portland Cement Rock.]

CENTRAL STATIONS

Annual Load Factor. Developing the Electrical Possibilities in Arkansas. Elec. World, vol. 75, no. 22, May 29, 1920, pp. 1265-1267, 6 figs. How combination of seasonal loads and ordinary commercial lighting and power loads gives high annual load factor to Arkansas Light & Power Co.

Austria. The Central Stations of Austria and Their Present Development (Die öffentlichen Elektrizitätwerke Oesterreichs und deren bisherige Entwicklung), L. Rosenbaum. Elektrotechnik u. Maschinenbau, vol. 38, no. 1, Jan. 4, 1920, pp. 6-8, 2 figs. Tabular data of number and output of works are given covering years 1900-1914, by which it is shown that 85 per cent of all the plants are hydraulic.

Automatic Control. Automatic and Remote Control Generating Stations, A. G. Darling. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 846-848, 2 figs. Wiring diagrams of automatic and remotely controlled synchronous generator stations.

Baltimore. Baltimore's Improved Central Plant. Power Plant Eng., vol. 24, no. 7, April 1, 1920, pp. 363-367, 7 figs. Additions made to steam power plant increased its capacity by 77,500 kw.

Boston, Extension to. Extension to L. Street Station, Boston, Charles H. Bromley. Power, vol. 51, no. 4, Jan. 27, 1920, pp. 124-129, 14 figs. Emphasis is laid on equipment for economical operation of four Babcock & Wilcox cross-drum water-tube boilers, each of 12,320 sq. ft. of heating surface.

California. The Industrial Load in California. Elec. World, vol. 76, no. 9, Aug. 28, 1920, pp. 428-430, 2 figs. Central station figures for first quarter of year indicate large increases in industrial load.

Canada. Central Electric Station Industry in Canada. Can. Engr., vol. 38, no. 26, June 24, 1920, pp. 593-596, 3 figs. Statistics giving number of stations, total revenue from sale of power, total operating expenses, salaries and wages, number of persons employed, etc. On Jan. 1, 1919, there were 795 central stations developing a total of 1,841,114 hp.

Coal Storage. See COAL STORAGE, Central Stations.

Communication with Substations. Intercommunications of Central Electric Station and Substations Feeding High Tension Net-work (Note sur les liaisons entre une centrale électrique et les sous-stations alimentant un réseau de distribution à haute tension), A. Laucagne. Revue générale de l'électricité, vol. 7, no. 5, Jan. 31, 1920, pp. 157-162, 5 figs. Discusses introducing system of wireless telegraphy and telephony, similar to that at present used in telephone systems, which centralizes control at office of load-dispatcher.

Connections. Relative Merits of Connections Employed in High-Voltage Generating Stations, Ernest Fragst. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 386-391, 8 figs. Suggestions for planning system of connections for central station.

Development. Vision in Power Development, Frederick Darlington. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 930-932. Test of war is said to have proven strong position of central station in power production. Writer believes that government aid is needed to realize full benefits of centralized systems.

Economical Operation. Central-Station Operation and District Heating Service, L. Kentish-Rankin. Elec. Rev., vol. 7, no. 1, Jan. 3, 1920, pp. 19-21. Points out opportunities for increasing revenue and conserving fuel.

Economy in Fuel Consumption, C. E. Stromyer. Eng. & Indus. Management, vol. 3, no. 7, Feb. 12, 1920, pp. 195-198. Writer suggests that wherever two works are situated not too far apart, one requiring much power and the other much steam for boiling, they could with advantage combine their steam requirements and thus reduce their joint coal bill by one-half.

Operating Economy Views from Several Angles, F. R. Phillips. Elec. Ry. Jl., vol. 54, no. 22, Dec. 27, 1919, pp. 1039-1046. Symposium held at meeting of Central Elec. Ry. Assn.

Electric-Furnace Loads. Electric Furnace Power from the Standpoint of the Central Station, E. A. Wilcox. Gen. Meeting Am. Electro-

chemical Soc., Apr. 8-10, 1920, paper no. 38, pp. 589-609, 2 figs. Questions relative to operation of electric furnaces from central power station are discussed, such as comparison with other kinds of power station loads, methods of charging for power, off-peak service (particularly to steel castings plants), continuous vs. intermittent service, power rate schedules and different systems of furnaces and their demands on power supply.

The Electric-Arc Melting Furnace and the Central Station Electric Company, Augustus C. Smith. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 43, pp. 701-709, 7 figs. Effect electric-arc melting furnace has on power supply, particularly surges on line because of careless handling of furnace during melting-down period. Experience is quoted of abnormal requirements of number of furnaces and it is pointed out how economical operation may be effected by careful working.

The Electric Furnace as a Central Station Load with Particular Reference to Phase-Balancing Systems, R. D. Evans. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 373-379, 20 figs. Present trend of developments is believed to indicate that in future more attention will be paid to methods of balancing furnace loads and to determining cost of supplying unbalanced loads.

Expansion in 1920. Central-Station Expansion in 1920. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 518-520. Analysis of returns received indicates that about 1,500,000 kw. will be added to generating capacity of central stations in 1920.

Financing. Central-Station Financing, H. M. Addinsell. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 725-727. Proper ratio of debt to capitalization and of earnings to interest. From paper read before Assn. of Edison Illuminating Companies.

France. Description of and Operating Experiences in a Large French Central Station (Ein französisches Grosskraftwerk, Beschreibung, Betriebserfahrungen), E. Cramer. Elektrotechnische Zeitschrift, vol. 41, no. 27, July 8, 1920, pp. 528-530, 8 figs. Describes the Valenciennes central station plant as an example of French-Belgian technique in the construction of electrical works. Points out defects along with advantages of plant.

Germany. Enlargement of the Franken Central Station at Nuremberg During the War (Erweiterungen des Grosskraftwerkes Franken A.-G., Nürnberg, in den Kriegsjahren), Georg Maas. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 13-14, Apr. 3, 1920, pp. 299-304, 11 figs. Notes on coal- and ash-conveying plants, vertical tube boiler plant, feedwater purification and softening plant, permutit filter plant, feedwater tanks with filters for removal of oxygen, etc.

Large Central Stations (Das elektrische Grosskraftwerk), Artur Fürst. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 7, Sept. 1919, pp. 90-104, 13 figs. General remarks on principles of their construction and equipment, followed by description and illustrations of central station at Golpa in Saxony, which was constructed during war and which, in its vast and up-to-date equipment, is said to surpass anything in Europe. The yearly output is said to be 800 million kw-hr.

The Zschornewitz Central Power Station (Das Grosskraftwerk Zschornewitz-Golpa), G. Klingenberg. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, nos. 44 and 46, Nov. 1 and 15, 1919, pp. 1082-1089 and 1145-1150, 24 figs. Details and illustrations of plant with capacity of 180,000 kva., which was begun in Feb. 1915, and delivered current to Berlin (distance of 128.7 km.) December 15 of same year. Part of current, it is said, is for supplying power to factory in vicinity for production of NU_2, this part of line being copper, whereas remainder of line to Berlin is of aluminum.

Improvements. Present-Day Desiderata in the Construction of Central Stations (Neuere Gesichtspunkte für den Bau von Grosskraftwerken), G. Klingenberg. Elektrotechnische Zeitschrift, vol. 41, nos. 29, 30, 31, 32 and 33, July 22, 29, Aug. 5, 12 and 19, 1920, pp. 561-564, 586-590, 609-612, 630-633 and 650-654, 50 figs. Notes on thermotechnical improvements of power stations, improvement of heat balance, feedwater preheating, combustion preheating; increased mechanical operation of plants; reduction of cost of installation—cast- and wrought-iron feedwater heaters, arrangement of live steam piping, smokestacks and flues; coupling of the plants, size of the reserves; utilization of by-products, modern gas producers and gas turbines; protection against excess voltages and excess currents; reactance coils, generator protection, connections between generators and switch gear; development of porcelain insulators, etc.; ring networks, etc.

Interconnection with Industrial Plants. Interconnecting Industrial and Central-Station Plants, Cornelius G. Weber. Power, vol. 51, no. 26, June 29, 1920, pp. 1049-1052, 5 figs. With data from a number of individual cases writer gives some indication of large savings in coal, labor and transportation that would be possible from electrical interconnection on a give-and-take basis.

Italy. See Military.

Large, Industrial Need of. Urgent Need of Super-Power Developments, C. F. Lacombe. Elec. World, vol. 75, no. 20, May 15, 1920, pp. 1128-1131, 1 fig. It is said that increased industrial production and shortage of power over large manufacturing districts call for immediate development of great power projects and elimination of small steam plants.

Load Dispatching. Keeping Records That Aid Load Dispatching, Frank Gillooly. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1 and 8, 1919, pp. 864-867, 7 figs. Forms used by load dispatcher whose duty is to forecast demand to be met, schedule it on generating stations, ascertain that each station will have boiler, generator and cable capacity to carry its load, and that there will be reserve equipment on system sufficient to compensate for loss of largest unit running.

Metering Practice. Steam-Plant Metering Practice, Robert E. Dillon. Elec. World, vol. 76, no. 13, Sept. 25, 1920, pp. 630-632, 6 figs. Instruments used and methods followed.

Military. Electric Installations at the Front (Gli impianti elettrici alla fronte). Elettricista, vol. 8, no. 13, July 1, 1919, pp. 97-104, 16 figs. Details of 1800-kw. hydroelectric central station in Isonzo at Sagrado.

New Orleans Ry. & Light Co. New Orleans Ry. & Light Co.'s System. Southern Eng., vol. 32, no. 6, Feb. 1920, pp. 37-41, 11 figs. Capacity of station is 50,000 kw. Alternating-current distribution is employed connecting several substations.

Newcastle-upon-Tyne. A Modern Power Station and Its Development, J. S. Watson. Elecn., vol. 84, no. 2194, June 4, 1920, pp. 620-621. Account of development in generating plants installed by Newcastle-upon-Tyne Electric Supply Co., Ltd., total period of 29 years being divided into four stages, and salient features of various stages are described. It is maintained present station is probably most efficient in world, characteristic changes comprising increase in boiler pressure, increase in steam

temperature, higher speed of plant, large individual size of generating units, and more complete utilization of labor-saving appliances.

Nuremberg, Germany. The Enlargement of the Franken Central Power Plant in Nuremberg during the War (Erweiterungen des Grosskraftwerkes Franken A.-G., Nürnberg, in den Kriegsjahren), Georg Maas. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 12, Mar. 20, 1920, pp. 269-273, 8 figs. Notes on construction of plant in 1912-1913 and its almost constant extension during the war because of increase of current required for the war industry. Description of plant and of experiences in operation of different apparatus, as well as of improvements in the boiler plant, the ash-handling equipment, removal of ashes, and water purification apparatus.

Oil-Burning Engines for. Oil-Burning Engines for Central-Station Operation, C. H. Reeder. Elec. Rev. (Chic.), vol. 77, no. 3, July 17, 1920, pp. 77-80, 5 figs. In sizes up to 2000 or 2500 kw. the oil-burning engine, it is stated, is taking its place as a prime mover in generating plants. Equipment is said to be available in many sizes suitable for central-station industry.

Oil Fields. Electric Power in the Oil Fields as a Central Station Load, W. G. Taylor. Gen. Elec. Rev., vol. 23, no. 7, July 1920, pp. 616-629, 12 figs. Detailed information is given as to nature of oil-field load, motor equipment for various local conditions, cost of installation and power consumption. Comparing electric drive with gas-engine drive, tables are included showing time saved by former, increased production and lower operating expense. Paper read before Nat. Elec. Light Assn.

Operating Ratio Decrease. Central-Station Operating Ratio Decreasing. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 260-261, 5 figs. Claims that in spite of increasing costs of labor and materials, manufacturing and distribution costs per kilowatt-hour are now on decline.

Personnel. The Personnel of the Industry, William C. L. Eglin. Elec. World, vol. 74, no. 19, Nov. 20 and Dec. 6, 1919, pp. 998-1001, 3 figs. Importance of organizing personnel bureau in central stations as aid in selection, trading and general welfare of employees.

Power Control. Power Control and Stability of Electric Generating Stations, Charles P. Steinmetz. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 756-768, 2 figs. Effect of power limitation upon stable operation of large generating stations.

Power Factor. See POWER FACTOR, Central Stations.

Pulverized Coal. See PULVERIZED COAL, Central Stations.

Rates. Central Station Power Rates, G. M. Gadsby. Assn. Iron & Steel Elec. Engrs., Sept. 1919, pp. 16-24, 5 figs. How varying demands for power at different times of day affect increase of power rate more in local stations than in central stations.

Central Station Power Rates, E. C. Stone. Assn. Iron & Steel Elec. Engrs., Sept. 1919, pp. 1-15, 2 figs. Fundamental principles involved in methods in use for making up rate schedules. Showing how it is to the benefit of the community as well as to that of central stations that central station load be developed to greatest possible degree.

Central-Station Rates in Theory and Practice, H. E. Eisenmenger. Elec. Rev. (Chicago), vol. 75, nos. 18-26, Nov. 1 (p. 728), Dec. 27, 1919. Nov. 1: Rates based on demand, on both energy consumption and demand, and on both energy and demand time interval of maximum; how demand is determined and other details. Combined energy and demand rates; substitutes to approximate measured demand. Arithmetical and alegebraic analysis of rate schedules. Growth and scope of public utility regulations by commissions. Organization and procedure of State Commissions. Their procedure in rate cases. Questions involving valuation of physical and intangible property of utility.

Note on the Determination of Central Station Rates (Notes sur la tarification de l'énergie électrique), Edwin Brandenburg. Société Belge des Électriciens, vol. 33, July-Sept. 1919, pp. 188-198, 3 figs. A priori determination of relation between electrical quantities and cost elements giving greatest economy.

Reactors, Use of. Stabilizing Large Generating Systems. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 5-8, 5 figs. Value of feeder reactance in keeping alternators in synchronism is illustrated by relating instance in which serious breakdown was traced to lack of sufficient protective reactances.

Service. Service, S. M. Kennedy. Nat. Elec. Light Assn. Bul., vol. 7, no. 5, June 1920, pp. 335-343. In order to fully analyze subject of service, writer considers it from two angles: (1) On what good service depends, and (2) what depends on good service.

Spain. Scheme for Centralization of Distribution of Electrical Energy in Spain (Un projet de réseau national de distribution d'énergie électrique en Espagne), F. Chapelain. Revue générale de l'Électricité, vol. 7, no. 8, Feb. 21, 1920, pp. 277-280, 1 fig. Report of committee appointed by Spanish Ministry of Production to study possibility and convenience and approximate cost of developing such scheme in Spain.

Statistics. Value of Statistics in Central-Station Operation, Edwin J. Fowler. Elec. Rev. (Chicago), vol. 75, no. 21, Nov. 22, 1919, pp. 867-869, 3 figs. Methods of organizing and maintaining work of compiling essential statistics for central station.

Storm Detector. See STORM DETECTOR.

Superpower. Design of a Superpower Station, H. Goodwin, Jr. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 399-418, 15 figs. Method of designing is exemplified by working out case of steam-turbine generating station of 245,000-kw., 300,000-kva. capacity and 66,000-volt distribution.

Economical Supply of Electric Power for the Industries and the Railroads of the Northwest Atlantic Seaboard, W. S. Murray. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 219-222. Super-power plan which, it is claimed, provides means by which present estimated capacity of 17,000,000 hp.—divided 10,000,000 for industrial purposes and 7,000,000 for railroads—in region between Boston and Washington and inland from coast 100 to 150 miles, now operating with load factor not exceeding 15 per cent, can be lifted to load factor of more than 50 per cent and possibly 60 per cent.

Proposed Super-Power Central Station, John A. Stevens. Power, vol. 51, no. 21, May 25, 1920, pp. 832-836, 3 figs. partly on supp. plate. Proposed design of super-power station built with multiples of 30,000-kw. units up to total station capacity of any value between 100,000 kw. and 500,000 kw. Each unit consists of four 1716-hp. boilers, normal rating, served by one stack centrally located and supplying steam to one 30,000-kw. turbine. All boiler houses are separated from their turbine rooms by explosion gap and turbine rooms are separated by explosion walls.

Switzerland. Reserve Power House of the Lugano Central Station (Die Reservekraftanlage des Elektrizitätswerks der Stadt Lugano), Val. Sacchi. Schweizerische Bauzeitung, vol. 74, no. 18, Nov. 1, 1919, pp. 222-228, 12 figs. Equipped with 2400-hp. Sulzer-Diesel motor of 760 mm bore and 1020 mm stroke, coupled with 2200 k. v. a. three-phase a. c. generator.

Synchronous Operation. Use of Power-Limiting Reactors for Synchronous Operation, Charles P. Steinmetz. Elec. Rev. (Chicago), vol. 77, no. 14, Oct. 2, 1920, pp. 523-527. Extensive employment of reactors in generators, bus bars, tie cables and feeders is advocated. Paper read before Assn. of Edison Illuminating Companies.

United States. Central-Station Capacity Increasing Fast. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 332-334, 2 figs. Statistical data of central-station developments in United States. Total installation of 12,760,900 kw. on Jan. 1, 1920. Gain during 1919 reached approximately 9.8 per cent. Prime movers in central stations total 17,061,600 hp.

Growth in Central-Station Customers. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 161-163, 3 figs. Analysis of reports from 65 per cent of installed capacity of industry indicates that electrical customers have increased 81 per cent in 6 years. Power customers show increase of 67.2 per cent.

U. S. Census of Central Stations 1917. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 476-477, 1 fig. Census indicates 6542 central stations, with installed rating of 8,994,407 kw. and total output of 31,044,049,234 kw-hr. Stationary motors served number 555,924, with continued rating of 9,216,330 hp.

Vermont. Interconnection in Southern Vermont. Elec. World, vol. 76, no. 2, July 10, 1920, pp. 70-72, 6 figs. Centralization of dispatching function said to be helpful. Graphic analysis of intercompany operations.

[See also ELECTRIC PLANTS; ELECTRIC POWER; HEATING, District Heating Service; HYDROELECTRIC PLANTS; POWER PLANTS; STEAM-ELECTRIC PLANTS; SUBSTATIONS.]

CENTRIFUGAL FANS

See FANS, CENTRIFUGAL.

CENTRIFUGAL MACHINES

Energy Losses. Determination of Energy Losses in Centrifugal Machines by Means of their Characteristics (Buerteilung des Energieverlustes von Kreiselradmaschinen auf Grund ihrer Kennlinien), R. Müller. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 18 and 19, June 30 and July 10, 1919, pp. 173-178, and 189-192, 10 figs. Theory is advanced for determination of working free of shocks of a centrifugal machine and for dividing the energy loss into its principal components, provided its construction drawings and test characteristics are on hand.

CENTRIFUGAL PUMPS

See PUMPS, CENTRIFUGAL.

CENTRIFUGAL TESTING PLANTS

See STEAM TURBINES, Centrifugal Testing Plants.

CENTRIFUGALS

Laboratory. The Prevention of Sugar Deterioration by the Use of Superheated Steam in Centrifugals, Nicholas Kopeloff. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 860-862, 1 fig. Method is developed for employing superheated steam in laboratory centrifugals by means of which, it is said, bacterial content of sugar has been reduced 93 to 99.5 per cent and number of mold spores 92 to 98 per cent.

Sugar. Protection Devices for Centrifugals (Schutzvorrichtungen an Schleudern), Berthold Block. Zeitschrift des Vereins der deutschen Zucker-Industrie, no. 769, Feb. 1920, pp. 73-100, 22 figs. Details and illustrations of various patents. Notes on various types of covers and their operation.

CERAMIC INDUSTRY

Kilns. See KILNS, Ceramic.

Post-War Status. The Post-War Status of the Ceramic Industries, A. V. Bleininger. Chem. & Metallurgical Eng., vol. 23, no. 13, Sept. 29, 1920, pp. 629-630. Outline of need for reducing fuel consumption and for introduction of labor-saving devices, with short review of economic status in manufacture of various clay products.

Troubles Due to Sulphur. Effect of Sulphur in Coal Used in Ceramic Industries, C. W. Parmelee. Coal Age, vol. 17, no. 1, Jan. 1, 1920, pp. 12-14. Troubles caused by sulphur in form of oxide.

CERAMIC MIXTURES

Colors Produced by Nickel Oxide. A Glaze Study Involving Some Interesting Colors Produced by Nickel Oxide, J. D. Whitmer. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 663-670. Grays were obtained in tests from oxide of nickel in presence of magnesium oxide.

CERAMIC PRODUCTS

Shrinkage Phenomena in. The Shrinkage Phenomena of Ceramic Masses (Ueber die Schwindungsvorgänge bei keramischen Massen), W. Pukall. Sprechsaal, vol. 52, nos. 46 and 47, Nov. 13 and 20, 1919, pp. 443-445 and 453-456. Results of experiments with different ceramic forms and objects. Writer mentions that this work is not intended as an exhaustive study of subject, but rather as incentive to further research in an important field in which as yet little investigation has been made.

CERIUM

Castings from. Cerium and Its Alloys, Charles Vickers. Brass World, vol. 5, no. 11, Nov. 1919, pp. 330-332, 3 figs. Specifications contained in United States patent for "process of making castings of rare-earth metals and their alloys."

CHAIN

Navy Stud Cable. Chain Cable and Some of its Properties, C. G. Lutts. Am. Drop Forger, vol. 6, no. 7, July 1920, pp. 322-326, 9 figs. Material, processes of manufacture, heat treatment and physical properties of power-forged chain as made at Boston Navy Yard.

Making Navy Stud Chain Cable, C. G. Lutts. Iron Trade Rev., vol. 66, no. 26, June 24, 1920, pp. 1819-1823, 8 figs. Process at Boston Navy Yard with special reference to heat treatment and tests to which chain is submitted before entering service. Paper read before Am. Soc. Testing Materials.

Roller. See ROLLER CHAIN.

CHAIN DRIVE

Theory. On Chain Driving Theory, F. M. Lawson. Eng., vol. 110, no. 2844, July 2, 1920, pp. 1-4, 5 figs. Formula and graphs are developed for computing in any case most economical characteristics of chain drive. Results of experimental tests are included.

CHAINS, SURVEYORS'

Extension Tests. Tests of Extension in Steel Surveyor's Chains. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, p. 957, 1 fig. It was found that extension due to pull is almost altogether caused by bending of small links; is much greater for old and worn than for new or nearly new chains; and increases less rapidly than load, especially in case of more worn chains.

CHARCOAL

Activation of. Charcoal Activation, H. H. Sheldon. Proc. Nat. Acad. of Sciences, vol. 6, no. 4, April 1920, pp. 178-182, 4 figs. Results of experiments at University of Chicago on variations due to heat treatment in absorption of gases by charcoal.

Charcoal Activation, H. Horton Sheldon. Physical Rev., vol. 16, no. 3, Sept. 1920, pp. 165-172, 8 figs. Study of heat effect on adsorption of hydrogen and nitrogen by charcoal. It is demonstrated that activation takes place by slow oxidation at room temperature.

Adsorption by. Note on the Adsorption of Nitrogen and Oxygen by Charcoal, Robert E. Wilson. Physical Rev., vol. 16, no. 1, July 1920, pp. 8-16. Discussion of previously published results on the adsorption of oxygen, nitrogen, and their mixtures in activated charcoal at liquid-air temperatures.

Studies in the Adsorption by Charcoal, H. H. Lowry and G. A. Hulett. Jl. Am. Chem. Soc., vol. 42, no. 7, July 1920, pp. 1393-1419, 12 figs. Experimental. Relation of service time to adsorption and absorption, and relation of oxygen to charcoal.

Chlorine-Absorbing Power. Some Aspects of the Behavior of Charcoal with Respect to Chlorine, G. S. Bohart and E. Q. Adams. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 523-544, 2 figs. Variations in chlorine-absorbing power between any two kinds of series studied was found to be greater than that which would result from any attainable variation in humidity of gas stream. Duration of complete chlorine absorption passes through minimum for relative humidity in neighborhood of 50 per cent.

Heat Treatment of. The Activation of Wood-Charcoal by Heat Treatment, James C. Philip, Sydney Dunnill and Olive Workman. Jl. Chem. Soc., vol. 117 and 118, no. 690, April 1920, pp. 362-369, 2 figs. Account of experiments on absorptive power of wood charcoal for (1) sulphur dioxide, and (2) methylene blue in aqueous solution.

Properties of. The Heat of Absorption of Vapors on Charcoal, Arthur B. Lamb and A. Sprague Coolidge. Jl. Am. Chem. Soc., vol. 42, no. 6, June 1920, pp. 1146-1170, 9 figs. Measurements of heat of adsorption of vapors of 11 organic liquids upon charcoal at 0 deg. cent. were made over considerable range. Resulting values are shown to be reproducible and independent of rate of adsorption of vapor and of previous history of charcoal.

CHARTS

Weights of Rods and Tubes. Time-Saving Tube and Rod Charts, Melvin D. Casler. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 67-70, 1 fig. For calculating weights of rods and tubes of different shapes.

Weight of Round Bars. Weight Chart for Bar Stock Articles, Hans Ernst. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 351, 1 fig. Chart for determining length and weight of round stock.

CHEMICAL AFFINITY

Cohesion and. See COHESION, Chemical Affinity and.

CHEMICAL ANALYSIS

Metals, X-Ray. Analysis by X-Rays. Eng., vol. 109, no. 2829, Mar. 19, 1920, pp. 365-366, 7 figs. Survey of recent developments in analysis of metals. Paper read before Röntgen Society.

CHEMICAL COMPOUNDS

Graphic Representation. Graphic Representation of Chemical Compounds and Reactions in the Gibbs Triangle (Graphische Darstellung chemischer Verbindungen und Reaktionen im Gibbsschen Dreieck), Otto Liesche. Zeitschrift für physikalische Chemie, vol. 94, no. 5-6, May 14, 1920, pp. 663-690, 16 figs. Report from the Kaiser-Wilhelm Inst. for Chemistry, Berlin-Dahlem.

Spectral Analysis. The Importance of Adsorption Spectral Analysis for the Determination of the Constitution of Inorganic Compounds (Die Bedeutung der Adsorptionsspektralanalyse für die Erforschung der Konstitution anorganischer Verbindungen), Konr. Schaffer. Zeitschrift für angewandte Chemie, vol. 33, no. 8, Jan. 27, 1920, pp. 25-29, 6 figs. Writer concludes that true spectrum of a substance can be ascertained only when it is analyzed in the form of gas, and that determination of the solution spectra is possible only by means of gas spectra.

CHEMICAL CONSTANTS

Determination. Note on the Determination of Chemical Constants, Alfred C. Egerton. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 1-20. Methods of calculating chemical constants and conditions necessary for obtaining accurate results are discussed. It is claimed that the older formula by which most of constants were calculated leads to result without physical significance. Formula which should be used, writer contends, requires knowledge of specific heat of substance.

CHEMICAL ELEMENTS

Absorption, Frequency of. The K-Characteristic Absorption Frequencies for the Chemical Elements Magnesium to Chromium, Hugo Fricke. Physical Rev., vol. 16, no. 3, Sept. 1920, pp. 202-215, 10 figs. Results of experiments are recorded which give for each element wavelengths of different remarkable points in structure of discontinuities. Theoretical bearing of new observations is briefly discussed.

Atomic Structure. Recent Views on the Chemical Elements and Their Atoms (Neuere Anschauungen über die chemischen Elemente und ihre Atome), Emil Kohlweiler. Physikalische Zeitschrift, vol. 21, no. 8, Apr. 15, 1920, pp. 203-208. Points out that it has been definitely shown that atoms consist not only, according to the Rutherford-Bohr ideas, of an external electron system and a central, electropositively charged and relatively small core section, but that this core section itself is constructed of electrons and helium cores. Writer develops an isotopic and atomic construction theory which he claims is confirmed by the Rutherford experiments also described.

Atomic Weights. A New Periodic Relation Between the Atomic Weights of the Chemical Elements (Ueber eine neue periodische Beziehung zwischen den Atomgewichte der chemischen-Elemente), Karl Fehrle. Physikalische Zeitschrift, vol. 21, no. 6, Mar. 15, 1920, pp. 162-166. Based on quantum-theoretical considerations and the expression developed by author in previous work, an ideal series of atomic weights is derived, whose course coincides to the end with that of the series of actual atomic weights. The conditions of the ideal and the actual

atomic weights are a periodic function of the atomic weight, which is attributed to the conditions of the natural oscillation of the molecules and the oscillations of their "atoms."

Periodic System, Irregularities in. The Study of Certain Physical Properties of Elements and Simple Compounds (Zur Kenntnis einiger physikalischer Eigenschaften von Elementen und einfachen Verbindungen), W. Herz. Zeitschrift für anorganische und allgemeine Chemie, vol. 94, no. 1, Jan. 18, 1916, pp. 1-22. Author discusses a number of irregular occurrences in the periodic system and gives numerous calculations of which some he claims, particularly for elements and simple compounds, are as yet unknown, and others require critical analysis. From the pharmaceutical Inst. of the University of Breslau.

Undiscovered. A Search for an Alkali Element of Higher Atomic Weight than Cesium, L. M. Dennis and R. W. G. Wyckoff. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 985-990, 1 fig. Alkalies from 3500 g. of pollucite were subjected to fractionation (1) by precipitation of chlorides with hydrogen chloride, (2) by solution of perchlorates, (3) by crystallization of sulfates, and (4) by solution of alums. No indications of new elements were found.

CHEMICAL ENGINEERING

Course in. See ENGINEERS, Chemical.

CHEMICAL INDUSTRY

Concrete, Uses in. See CONCRETE, Chemical Uses.

Developments. Recent developments in Chemical Plant and Machinery, W. B. Davidson. Chem. Trade Jl. & Chem. Engr., vol. 67, no. 1741, Oct. 2, 1920, pp. 435-438. Developments in England in manufacture of sulphuric acid, developments in German chemical plant, and survey of patents and inventions.

Health Hazards. See HEALTH, Chemical Industry, Hazards in.

Japan. The Chemical Industry and Trade of Japan, O. P. Hopkins. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 110-119. Efforts are said to have so far been directed mainly toward development of coal-tar industry, production of alkalies for paper, glass, textile, and soap industries, progress in metal refining, and greatest possible utilization of water power in electrochemical processes.

New York Exposition. Sidelights on the Chemical Exposition. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 653-657, 4 figs. Notes on new developments as featured at Sixth National Exposition held in New York, September 20 to 25.

Niagara Falls. See HYDROELECTRIC PLANTS, Niagara.

Progress in. Reports on Progress in Chemical Industry in 1919. Jl. Soc. Chem. Industry, vol. 39, no. 2, Jan. 31, 1920, pp. 29r-33r. Notes on gas industry, iron and steel, non-ferrous metallurgy, sugar, fermentation industries, rubber and leather.

Southern U. S. Chemistry and the South, Arthur D. Little. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 710-714. Exposition of interrelation between fuel, power, cellulose and mineral wealth, with an indication of the future advance in Southern industry when founded on its obvious advantages.

Spain. The Chemical Industry and Trade of Spain, O. P. Hopkins. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 223-227. With tables giving imports and exports of chemicals and allied products.

[See also ELECTRIC FURNACES, Uses.]

CHEMICAL REACTIONS

Maximum Temperature. The Maximum Point of Temperature (Der Maximalpunkt der Temperatur), Walther Jankowsky. Zeitschrift für Elektrochemie, vol. 25, no. 19-20, Oct. 1, 1919, pp. 325-328. Following deductions are reached: Heat of reaction at medium temperatures is attainable to great extent by conversion of potential energy into heat, which is said to prove that not only a zero but also a maximum temperature must exist, as well as definition of both temperature points; both temperature extremes are only asymptotically attainable.

Quantum Theory, Application of. An Unsolved Problem in the Application of the Quantum Theory to Chemical Reactions, W. C. M. Lewis. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 26-31. On applying quantum theory to unimolecular chemical reactions, it is argued that very different results are obtained according as continuous or discontinuous view of absorption of radiation are assumed. Comparison of observed with calculated volume of velocity constants, shows greater discrepancy on discontinuous view than upon continuous.

CHEMICAL WARFARE SERVICE

Development of. Outline of Development of the Chemical Warfare Service, F. M. Dorsey. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 1-9. Experimental work done in order to produce satisfactory absorbent for chlorpicrin and phosgene.

CHEMICALS

Handling. See HANDLING MATERIALS, Chemicals.

Sea Shipment of. Transport of Chemicals by Ship. Chem. Age, vol. 28, no. 5, May 1920, pp. 169-171. Gives British Board of Trade Provisions for Sea Shipment of Chemicals.

CHEMISTRY

Colloidal. Colloid Chemistry and Its Application in the Arts, Joseph V. Meigs. Chem. Age, vol. 2, no. 1, Jan. 10, 1920, pp. 325-329. Brings out how colloid chemistry furnishes clearer understanding of many manufacturing processes and their products and consequently makes possible development of former and more effective exploitation of latter.

Physical, Progress in 1919. Report on the Progress in Physical Chemistry in 1919 (Bericht über die Fortschritte der physikalischen Chemie in Jahre 1919), W. Herz. Chemiker-Zeitung, vol. 44, nos. 9, 11 and 14, Jan. 20, 24 and 31, pp. 61-62, 74-76 and 94-96. International review of works on elements and atoms, radioactivity, condition of gases and liquids, liquid crystals, solutions, chemical mechanics, thermochemistry, electrochemistry, magnetochemistry, and photochemistry.

Physical, Research in 1918. Physical Chemistry in 1918 (La chimie physique en 1918), A. Pinkus. Jl. de Chimie Physique, vol. 17, no. 3, Nov. 30, 1919, pp. 425-517. Survey of researches published in technical literature of the world.

Progress Since 1870. Progress of Chemistry, Edward Thorpe. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 217-219. Outline of development during last 50 years.

Research in. A Plan for Incentive to Research in Pure and Applied Chemistry, William J. Hale. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 690-696. Plan proposed contemplates providing pecuniary facilities whereby technical men will feel justified to engage their activities in research work. Writer emphasizes that "the best men, the live men,

the men who have the mental grasp for bigger things, will not tarry too long where life is difficult and honor shallow.''

[See also CATALYSIS; CHEMICAL REACTIONS; COLLOIDS; ELECTROLYTES; HALOGENS; HYDROCARBONS; OSMOSIS; SOLUTION; SOLUTIONS; VALENCY.]

CHIMNEYS

Anaconda Smelter. Highest Chimney Built for Smelter at Anaconda, Montana. Eng. News-Rec., vol. 83, no. 17, Oct. 23, 1919, pp. 764-765, 4 figs. Brick stack is 585 ft. above ground and has 60-ft. top inside diameter. Concrete base on rock 3 to 10 ft. below.

Concrete. New Concrete Chimney System. Concrete, vol. 17, no. 1, July 1920, pp. 33-34, 4 figs. Coniform design in which monolith is strengthened with series of vertical and integral ribs, half round in section, extending from bottom to top and terminating at base of ornamental top.

Demolition of. Felling a Concrete Chimney, A. D. Butler. Eng. News-Rec., vol. 84, no. 19, May 6, 1920, pp. 899-901, 3 figs. Difficulties involved by proximity of buildings in demolishing 210-ft. reinforced-concrete stack in city of Spokane, Wash.

Design. Saving the Waste in the Chimney—VI. Chimney Proportions for Fuel Oil Practice, Robert Sibley and Chas. H. Delaney. Jl. Electricity, vol. 43, no. 11, Dec. 1, 1919, pp. 513-515, 3 figs. Diagram for ascertaining chimney diameters in fuel oil practice.

Earthquake-Resisting. Self-Supporting Chimneys to Withstand Earthquake, C. R. Weymouth. Mech. Eng., vol. 42, no. 3, March 1920, pp. 157-160 and 204-205, 2 figs. Studies of Japanese investigating committee are examined in light of records secured from San Francisco earthquake of 1906. Theory is developed that a chimney should be considered as body oscillating about center of percussion.

Heat Losses in. Reading Chimney Losses Direct from CO_2 Charts, C. C. Phelps. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 133-136, 6 figs. Illustrates why average CO_2 does not indicate chimney loss.

Hydraulic Lime for. Hydraulic Lime for Chimneys (Wasserbindekalk für Schornsteine), M. Bulnheim. Tonindustrie, vol. 44, no. 13, Jan. 29, 1920, pp. 113-114. It is concluded that hydraulic lime can be substituted for portland cement in chimney mortar only when it is sufficiently confirmed that strength of mortar is at least the same; and great care should be taken in testing stability of chimneys which should fulfill official requirements of a wind load of 200 kg. per sq. m.

Radial Brick. Anaconda Chimney Largest and Tallest in the World. Public Works, vol. 48, no. 9, Mar. 13, 1920, pp. 181-183, 3 figs. Structure is 585 ft. tall, weighs 30,000 tons and has 60 ft. inside diameter at top. It is said that 6,000,000 radial bricks were required.

Reinforced-Concrete. New Type of Reinforced Concrete Stack. Concrete Products, vol. 19, no. 1, July 1920, pp. 43-45, 4 figs. Vertical integral ribs for strengthening and beautifying structure.

Stability. The Stability of Chimneys (Die Standsicherheit der Schornsteine), Otto R. Jäcker. Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, nos. 11, 12, 13, 14 and 15, June 15, 30, July 15, 31 and Aug. 15, 1920, pp. 88-91, 97-99, 105-107, 6 figs., 113-115 and 121-123, 2 figs. New basic principles evolved from elastic behavior of building material and dynamic influences of wind; recommendations for standard building regulations.

[See also STACKS.]

CHINA CLAY

England. The China Clay Industry of the West of England, Henry F. Collins. Min. Mag., vol. 22, nos. 1 and 2, Jan. and Feb. 1920, pp. 25-32 and 94-97. Notes on uses of china clay, output and export, and working cost and selling prices. Writer believes distinction between china stone and china clay is widely misunderstood, and points out that most characteristic features which distinguish them (after degree of decomposition of felspar) are: Fluor-spar, invariably absent from china clay rock, but always present in china stone, particularly in varieties known as ''purple''; and tourmaline, so characteristic of china clay rock, but absent from china stone.

CHLORIDES

Metallic, Solidification Points. Solidification Points of Mixtures of Metallic Chlorides, Fred C. A. H. Lantsberry and R. A. Page. Jl. Soc. Chem. Industry, vol. 39, no. 4, Feb. 28, 1920, pp. 37T-41T, 7 figs. Experiments with mixtures of sodium, potassium and calcium chlorides.

CHLORIDIZING

Processes for. Chloridizing Processes, Harai R. Layng. Min. & Sci. Press, vol. 120, no. 3, Jan. 17, 1920, pp. 77-83, 5 figs. That slow heating, specially in cases wherein sodium chloride is used, is cause of poor results is said to be proven by tests conducted on number of different types of ore.

CHLORINATION

See WATER TREATMENT, Chlorination.

CHLORINE

Determination. The Determination of Chlorine with the Nephelometer, Arthur B. Lamb, Paul W. Carleton and W. B. Meldrum. Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 251-259. It is stated that ''in a 50 per cent alcohol-water solution, heating silver chloride suspensions of widely differing concentrations to 40 deg. for 30 min. after precipitation, produces a more intense and constant opalescence than can be attained at room temperature.''

Interaction with Hydrogen. The Interaction of Chlorine and Hydrogen. The Influence of Mass, David Leonard Chapman and John Reginald Harvey Whiston. Jl. Chem. Soc., vols. 115 and 116, no. 685, Nov. 1919, pp. 1264-1269. It is concluded from study of equations and experimental research that hydrogen chloride produced is proportional to radiation observed and inversely proportional to concentration of oxygen.

Production of. See NITRIC ACID, Manufacture.

Uses of, Education in. Need of Coöperative Educational Work in the Chemical Industry, Jacob G. Cohen. Chem. & Metallurgical Eng., vol. 22, no. 11, Mar. 17, 1920, pp. 509-512. Plea for coöperative national education in uses of chlorine in daily life and examples of beneficial results already obtained by coöperative propaganda in many other fields of manufactured products.

CHLORINE CELLS

Notes on. Observations Regarding Chlorine Cells, F. G. Wheeler. Chem. & Metallurgical Eng., vol. 21, no. 7, Oct. 1, 1919, pp. 436-438. Concerning shape, efficiency, washing caustic from cathode, effect of steam treatment of cathode compartment, etc. Based on experiments and observations.

CHROMATE OF LEAD

See LEAD CHROMATE.

CHROME STEEL

Chromium-Molybdenum. A Brief Record of Results of the Annealing of a Chromium Molybdenum and a Chromium Steel, John Orth Liebig. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 168-171, 12 figs. Photomicrographs of specimens at various stages in process of annealing.

Heat Treatment. See STEEL, HEAT TREATMENT OF, Chrome Steel.

Properties. The Properties of Iron-Chromium Carbon Steels, C. A. Edwards, H. Sutton and G. Oishi. Iron & Steel Inst., Paper 14, Annual Meeting, May 6 & 7, 1920, 44 pp., 8 figs. Also in Eng., vol. 109, no. 2838, May 21, 1920, pp. 692-694, 8 figs. Temperatures at which carbides go into solution when steels are heated and those at which reverse change takes place on cooling were experimentally determined. Results found, which are given in tabulated and diagrammatic forms, indicate that temperature at which carbides separate from solution during cooling is raised by increased chromium and carbon content of steel.

Structure. The Structure of Some Chromium Steels, J. H. G. Monypenny. Iron & Steel Inst., Paper 16, Annual Meeting, May 6 & 7, 1920, 26 pp., 18 figs. Experiments with chromium steels containing between 1.5 and 15 per cent chromium. Properties of these steels were found to change progressively with increasing amounts of chromium. Most abrupt change was in production of austenite on quenching from high temperatures, limiting compositions giving this constituent having been fairly sharply defined. Rate of diffusion of carbides in chromium steels was found to be much lower than in ordinary steel, and chromium lowered carbon content of eutectoid point considerably and also decreased solubility of cementite in austenite.

Welding. Welding Heat-Treated Chrome Alloy Steel, J. Churchward. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 641-642, 7 figs. How controlling welding heat insured minimum of injury to original structure. Special welding machine employed. Saving defective forgings.

CHROME-NICKEL STEEL

Aeroplane-Engine Crankshafts. Establishment of Operating Conditions for the Production of Chromium-Nickel Steel for Aeroplane-Engine Crankshafts (Festlegung der Arbeitsbedindungen für die Erzeugung von Chromnickelstahl für Fliegerwellen), Erdmann Kothny. Stahl u. Eisen, vol. 40, no. 20, May 20, 1920, pp. 677-684, 1 fig. Results of a series of systematic tests showed that for furnace charge only high-grade material should be used; in order to maintain the required fibrous texture in the refined condition, even with purest charge, two oxidizing slags must be employed; a manganese content of more than 0.8 per cent renders texture in the refined condition granular, etc.

Brittleness. Brittleness in Nickel-Chrome and Other Steels, F. Rogers. Iron & Steel Inst., advance proof and account of meeting of May 6 and 7, 1920, 10 pp., 17 figs., 14 on supp. plate. Also in Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 594-596, and Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 587-588. Details in form of tables of analyses and test results, together with some heating and cooling curves.

Temper-Brittleness of Nickel-Chrome Steel, R. H. Greaves, Muriel Fell and Robert Hadfield. Engineering, vol. 108, no. 2805, Oct. 3, 1919, pp. 461-464, 7 figs. Also in Iron & Steel Inst., meeting Sept. 21-22, 1920, paper no. 4, 48 pp., 12 figs. It is concluded from results of experimental heat treatments that with nickel-chrome steels containing about 0.25 per cent carbon, 0.5 per cent manganese, 3.5 per cent nickel and 0.6 per cent chromium wide differences in impact figure, with almost identical tensile tests may be produced by suitable heat treatment.

Deoxidation. Effect of Deoxidation and of Period of Solidification on the Quality of Electric Chrome-Nickel Steel (Einfluss der Desoxydation und der Erstrrungsdauer auf die Güte von Elektro-Chromnickelstahl), Erdmann Pothny. Stahl und Eisen, vol. 40, no. 2, Jan. 8, 1920, pp. 41-45. Tests are said to show that a poor deoxidation of refined chrome-nickel steel causes granular structure and in consequence deterioration in quality: and also that a slow solidification is disadvantageous to structure as it causes strong cross-fibers.

Nichroloy Products. The Making of Nickel-Chromium Products, W. F. Sutherlan. Can. Machy., vol. 23, no. 2, Jan. 8, 1920, pp. 57-60, 5 figs. Manufacture of "nichroloy" products. "Nichroloy" is composed principally of low-carbon steel, chromium, silicon, manganese, aluminum and nickel.

Physical Properties, Initial Temperature and. The Effect of Initial Temperature Upon the Physical Properties of Steel, J. H. Andres, J. E. Rippon, C. P. Miller and A. Wragg. Iron & Steel Inst., Paper 18, Annual Meeting, May 6 & 7, 1920, 82 pp., 76 figs. Effect of variation in initial temperature upon position of resulting transformation points in certain nickel, chromium and chrome-nickel steels was experimentally determined. Volume change at normal transformation points was found to be composed of two changes working in opposition, allotropic change and change due to carbide. It is stated that quenching merely stereotypes condition of carbide, which, in its turn controls allotropic change. In general, it is believed that steels behave in much the same way as carbon steels, excepting that in latter time factor necessary to produce same changes in carbide is of much lower order.

Substitutes for. Substitutes for Chrome-Nickel Steels (Ersatzstähle für Chromnickelstähle), Erdmann Kothny. Stahl u. Eisen, vol. 39, no. 45, Nov. 6, 1919, pp. 1341-1348, 1 fig. Also in Motorwagen, vol. 22, no. 19, July 10, 1919, pp. 325-331. It is concluded that only pure chrome steel and pure manganese steel of certain composition, as stated by writer, may be used to replace chrome-nickel and nickel steels.

Torsion Elasticity. Torsion Elasticity of Nickel Steels with High Chromium Content (Étude de l'élasticité de torsion des aciers au nickel à haute teneur en chrome), P. Chevenard. Comptes rendus des Séances de l'Académie de Sciences, vol. 171, no. 2, July 12, 1920, pp. 93-96, 3 figs. Charts giving experimentally measured moduli of torsion of various nickel steels containing from 10 to 100 per cent chromium.

Uses in Automotive Industry. Some Applications of Alloy Steels in the Automotive Industry, H. J. French. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 501-505 and p. 547, 9 figs. Reference is made to uses of steel containing 1 per cent nickel and 1 per cent chromium and also 3 per cent nickel and 3 per cent chromium. Data are given for these two steels showing tensile properties and hardness developed in small-size rounds subjected to varying heat treatments. Mention is made of nickel-chromium steels and treatments used for gears and airplane-engine crankshafts. "Streaks" and "temper-brittleness," both encountered in use of nickel-chromium steels are discussed and curves showing tensile properties and hardness of "stainless steel" under varying oil-quenching and tempering treatments are presented, and also results of cutting tests made with cast high-speed steel milling cutters and comparison

is given with high-speed cutters made by present-day ordinary methods.

CHROMIC ACID

Electrolytic Regeneration of. A Continuous Process for Electrolytic Regeneration of Chromic Acid, Ralph H. McKee and Shoo Tze Leo. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 16-26, 5 figs. It is reported that it was found possible in experiments to destroy by action of electric current organic matter in waste chromium liquor without subjecting it to any preliminary treatments.

CHROMITE

Production in 1918. Chromite in 1918, J. S. Diller. Dept. of Interior, U. S. Geological Survey, May 15, 1920, pp. 657-725. Notes are included on foreign deposits of chromite, particularly in Cuba.

CHROMIUM

Deposits, North Carolina. Chrome-Ore Deposits in North Carolina, J. Volney Lewis. Eng. & Min. Jl., vol. 109, no. 20, May 15, 1920, pp. 1112-1114, 3 figs. Advance abstract of report prepared for U. S. Geol. Survey's investigation of war minerals. No large occurrences have been discovered, there are no reserves of ore, and no alluvial deposits of value have been found.

Electrolytic Production. Electrolytic Chromium, George J. Sargent. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 18, pp. 275-292. Alludes to history of deposition of chromium, including unpublished work done at Cornell University. Gives details of electrolysis of various mixtures of chromic sulphate and chromic acid, showing that yield of chromium from chromic-acid solutions is greatly increased by addition of chromic sulphate.

Metallurgy of. Concentration of Chrome Ore, Black Sand, and Ferro-Chrome Slag, J. C. Williams. Colo. School of Mines Magazine, vol. 10, no. 7, July 1920, pp. 131-137. General information regarding chromium and its uses; description of tests conducted at Department of Metallurgical Research of the Colorado School of Mines. Three types of material are considered: an ore from Montana, a "black sand" from Oregon, and a slag resulting from the production of ferro-chromium in the electric furnace.

CHROMIUM ALLOYS

Nickel-Chromium. See ALLOYS, Nickel-Chromium.

CHROMIUM STEEL

See CHROME STEEL.

CHROMIUM SULPHATE

New Complex Form. New Complex Form of Chromium Sulphate (Sur une nouvelle forme complexe du sulfate chromique), A. Recoura. Comptes rendus des Séances de l'Académie des Sciences, vol. 129, no. 24, Dec. 15, 1919, pp. 1163-1166. How lilac-grey specimen was obtained from normal solution of violet sulphate.

CHRONOMETERS

Regulating Mechanism. Regulating Mechanism of Chronometers (Sur les organes réglants des chronomètres), Jules Andrade. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 9, Aug. 30, 1920, pp. 458-461. Proposed simplification of present system employing spiral springs.

CHUCKS

Fitting to Spindles. Fitting Chucks to Spindles, Fred Horner. Machy. (Lond.), vol. 16, no. 416, Sept. 16, 1920, pp. 742-748, 28 figs. Description of various types of adapters.

Lathe. A New Lathe Chuck (Ein Neues Drehbankfutter). Metall-Technik, vol. 45, no. 33-34, Aug. 23, 1919, p. 130, 3 figs. Description and illustration of a chuck from which a piece of work can be taken without use of wrench or other tool.

Magnetic. Magnetic Chucks. Eng. Production, vol. 1, no. 8, Aug. 1920, pp. 283-288, 40 figs. Their construction and application.

Relative Characteristics of Magnetic Chucks, O. A. Kenyon. Mech. World, vol. 66, no. 1719, Dec. 12, 1919, pp. 279-280, 5 figs. Outline of principles embodied in construction of magnetic chucks.

The Magnetic Chuck, Its Design and Varied Uses, J. H. Moore. Can. Machy., vol. 23, nos. 16 & 17, April 15 and 22, 1920, pp. 369-372, 10 figs., and pp. 394-399, 12 figs. Fundamental principles of design, together with varied uses of magnetic chuck are discussed.

CHURCHES

Constructional Features. New Parish Church for a Montreal Suburb. Contract Rec., vol. 33, no. 45, Nov. 5, 1919, pp. 1020-1021, 4 figs. Constructional features of building being erected at cost of over $300,000.

CHUTES

Design. The Design of Chutes and Ore Bins, John S. Watts. Iron & Steel of Canada, vol. 3, no. 8, Sept. 1920, pp. 244-246. Also in Can. Min. Jl., vol. 41, no. 40, Oct. 8, 1920, pp. 817-819, 6 figs. Slope to give for different materials. Advantages of making chute in two sections.

CINEMATOGRAPHY

See MOTION-PICTURE PHOTOGRAPHY.

CINNABAR

Deposits. See MINERALS, Deposits, Idaho.

CIRCUIT BREAKERS

Arcless. Circuit Breaking Without Arcing (Ueber lichtbogenfreie Unterbrechung elektrischer Ströme), W. Burstyn. Elektrotechnische Zeitschrift, vol. 41, no. 26, June 30, 1920, pp. 503-505, 6 figs. Refers to Kraus's discovery that for every metal and every average voltage there is a certain limiting current strength, up to which a circuit can be opened without arcing. Gives detailed investigation of conditions with limiting current and for a large number of metals.

Automatic. Automatic Circuit-Breakers (Dispositifs automatiques de sectionnement des lignes électriques), P. Charpentier. Revue générale de l'Électricité, vol. 7, no. 15, Apr. 10, 1920, pp. 493-497, 16 figs. Oil three-pole circuit breaker built by Maljournal and Bourron Electric Works.

Calibration of. Convenient Circuit-Breaker Calibrating Outfit, H. J. Krombach. Elec. Ry. Jl. vol. 56, no. 3, July 17, 1920, pp. 133-134, 3 figs. Permanent circuit-breaker calibrating apparatus which has replaced temporary water rheostat on Third Avenue Ry., New York.

High-Speed. Circuit-Breaker with High-Speed Characteristics, J. F. Tritle. Elec. Rev. (Chicago), vol. 76, no. 14, Apr. 3, 1920, pp. 565-567, 6 figs. Type recently developed in which magnetic blowout has combination of two powerful magnetic fields and narrow arc chute for increasing speed of blowout and reducing arc-space required.

Oil Type. Increasing Oil-Circuit-Breaker Capacities. C. J. Hejda. Elec. World, vol. 76, no.

2, July 10, 1920, pp. 67-68, 1 fig. Standard oil breaker, equipped with pressure vents, hollow contact rods and an improved liquid for quenching the arc, said to have shown greatly increased rupturing capacity under actual tests.

Selection of Oil Circuit-Breakers, H. A. Travers. Elec. Rev. (Chic.), vol. 77, no. 1, July 3, 1920, pp. 1-3, 3 figs. Discussion of characteristics of different types of breakers, especially as applied to interconnected transmission systems.

The Selection of Oil Circuit Breakers, W. A. Coates. Electrician, vol. 85, no. 2198, July 2, 1920, pp. 17-20, 4 figs. Breaking capacity of oil switches and value of short circuit at any point on a system.

[See also RELAYS, Service-Restoring.]

CITIES

Hygiene and Employment. City Hygiene in Relation to Employment, David Brooks. Jl. Roy. Sanitary Instn., vol. 39, no. 4, June 1919, pp. 133-142. Suggests various ways of improving health conditions in a large city, with special reference to London.

Sanitation and Death Rates. Sanitation and Municipal Death Rates, George A. Soper. Can. Engr., vol. 37, no. 21, Nov. 20, 1919, pp. 475-476. Order in which sanitary improvements should be undertaken in a growing village. Paper presented at Second Pan-American Commercial Conference.

CITY PLANNING

Fire Prevention. Town Planning in Relation to Fire Prevention, Thos. Adams. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 921-924. It is pointed out that by insuring better building arrangements, securing compact civic development and correlating municipal activities, more effective protection is secured.

Industrial Development. Town Planning in Relation to Industrial Development, C. W. Kirkpatrick. Can. Engr., vol. 37, no. 24, Dec. 11, 1919, pp. 524-525 and 531-532. Because, it is noted, it is not possible to get "the most or the best out of a man unless he be happy and contented."

Legislation in 1919. The Legislation of 1919 in Relation to Municipal Engineering, J. B. Reignier Conder. Surveyor, vol. 57, no. 1464, Feb. 6, 1920, pp. 143-146. Statutes are given dealing with housing and town planning.

Montreal. Replanning Montreal and District, James Eqing. Jl. Eng. Inst. of Canada, vol. 3, no. 6, June 1920, pp. 283-288. Financial advantages derived from good city planning are pointed out. As example of disadvantages of not possessing carefully laid plan, case of Montreal is quoted.

Ontario. Planning and Development of Cities in Ontario, Thomas Adams. Can. Engr., vol. 37, no. 23, Dec. 4, 1919, pp. 509-510. Planning and development act of Ontario, which deals largely with planning as a matter of fixing location and dealing with widening, extension and relocation of highways and parkways is not considered satisfactory because it does not deal with town planning, i.e., "with the regulations for the use of land and character of building developed in cities, towns and rural areas."

Ottawa, Can. Town Planning, with Special Reference to Ottawa, Noulan Cauchon. Can. Engr., vol. 37, nos. 20 and 21, Nov. 13 and 20, pp. 455-457 and 477-479. Nov. 13: Problems of highway and railway. Nov. 20: Sunlight and office buildings.

Philadelphia. City Planning and Zoning in Philadelphia, James W. Follin. Jl. Engrs. Club of Phila., vols. 38-8, no. 188, Aug. 1920, pp. 316-326. Review of activities during past 25 years.

Preliminary Studies. The Planning of Land in Relation to Municipal and Social Problems, Thos. Adams. Can. Engr., vol. 37, no. 21, Nov. 20, 1919, pp. 472-474. How to conduct scientific investigations of regions and municipal areas as preliminary to preparing city and country planning scheme. Paper read before Am. Soc. for Municipal Improvements.

Principles. Principles of City Planning, Noulan Cauchon. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 653-654. From viewpoint of ethics, economics and art. Paper read before Joint Conference of Am. City Planning Inst. and Town Planning Inst. of Can.

Railway Terminals. See TERMINALS, RAILWAY, Relation to City Plan.

Relation to Municipal Development. City Planning and Its Relation to Municipal Development, Nelson P. Lewis. The J. E. Aldred Lectures on Engineering Practice, 1919-1920, Johns Hopkins University, Dept. of Eng., 1920, pp. 45-83, 19 figs.

Transportation and. City Building and Transportation, James Rowland Bibbins. Jl. Western Soc. Engrs., vol. 25, no. 12, Aug. 20, 1920, pp. 411-459 and (discussion), pp. 459-469, 25 figs. Technical relationships involved, with reference to conditions in large American cities.

Winnetka, Ill. The Proposed City Plan of Winnetka, Illinois, E. H. Bennett. Am. City, City Edition, vol. 21, no. 4, Oct. 1919, pp. 305-307, 3 figs. Provisions for establishing motor highways.

Zoning. City Zoning, Robert H. Whitten. Jl. Western Soc. Engrs., vol. 25, no. 2, Jan. 20, 1920, pp. 49-54. Writer believes that in order to enforce reasonable distribution of population in a great city, it is also necessary to enforce corresponding distribution of industry.

The Legality of Zoning Regulations, Herbert S. Swan. Am. City, City Edition, vol. 21, no. 5, Nov. 1919, pp. 458-459. Court decisions quoted as having withheld that city's expansion and growth are superior to individual caprice of land owners.

Zoning Cities for To-morrow, W. J. Donald. Can. Engr., vol. 37, no. 23, Dec. 4, 1919, pp. 510-512. Plan projected for Niagara Falls, which provides for six classes of zones or districts for which different conditions for use, height and area of buildings are specified.

Zoning System for Chicago. Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 49-51. Report of Assistant Corporation Counsel on experiences and mistakes of other municipalities.

CLAY PRODUCTS

Burning. Burning Clay Wares, Ellis Lovejoy. Clay Worker, vol. 73, no. 7, June 1920, p. 708, 1 fig. on supp. plate. Gives equalization table for circular pipes of given diameters.

Tiles. Clay Floor Tiles (Steinzeugfussbodenplatten), E. Tuschhoff. Tonindustrie-Zeitung, vol. 44, nos. 15 and 18, Feb. 3 and 10, 1920, pp. 132-134 and 160-161. Discusses phenomena occurring in the burning of dry-pressed floor tiles, also called mosaic tiles, and gives suggestions for eliminating the commoner troubles.

CLAYS

Bond. Properties of American Bond Clays and Their Use in Graphite Crucibles and Glass Pots, A. V. Bleininger. Technologic Papers of Bur. of Standards, no. 144, Jan. 28, 1920, 50 pp., 24 figs. Physical properties of three German clays formerly imported in large quantities are described on basis of constants which make possible accurate comparison and evalua-

tion of American materials. Similarly, physical characteristics of 23 American and 2 English bond clays are determined.

Bond Clay-Ash Mixtures. The Fusibility of Mixtures of Graphite Ash and Bond Clays, R. N. Long. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 626-633, 6 figs. It was found in experiments that ash from Alabama graphite has higher fusion point than ash from Ceylon and is less active as flux in bond clay-ash mixtures. No eutectic was found to exist between graphite ash and bond clay.

Calcined, Rehydration of. The Rehydration of Calcined Clays, J. S. Laird and R. F. Geller. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 828-832. As result of experimental work it is concluded that flint clay cannot be slaked by action of very hot water in any reasonable length of time, and plasticities of raw clays are little affected by such action; also that clays that have been calcined at temperatures higher than 700 deg. cent. can be rehydrated only very slowly and incompletely.

China Clay. The China Clay Industry of The West of England, Henry F. Collins. Min. Mag., vol. 21, no. 5, Nov. 1919, pp. 269-275, 5 figs. Geological occurrence and mineralogical characteristics of china clay, method of mining and preparation for market, and economic questions involved in its disposal.

Classification. Classification of Clays on a Ceramic Basis, Arthur S. Watts. Jl. Am. Ceramic Soc., vol. 3, no. 3, March 1920, pp. 247-251. Suggested classification is based on color, shrinkage, bonding strength, vitrification and fusion.

Crucible. See CRUCIBLES, Clays for.

Foundry. How to Test Clay for Foundry Use, Homer F. Staley. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 101-102. Opinion is expressed that time of slaking, bonding power, vitrification temperature and softening point, rather than chemical analysis, are factors which determine adaptability of clays for this purpose. Paper presented before American Foundrymen's Assn.

Kaolin. Kaolin in North Carolina, with a Brief Note on Hydromica, W. S. Bayley. Economic Geology, vol. 15, no. 3, April-May 1920, pp. 236-246.

Elutriation Tests on American Kaolins, H. G. Schurecht. Jl. Am. Ceramic Soc., vol. 3, no. 5, May 1920, pp. 355-377, 10 figs. States that elutriation of kaolins should be carried on with distilled water instead of tap water as soluble salts in tap water cause clay particles to coagulate and settle as larger grains; residue in each can should be thoroughly stirred each day to overcome error due to settling of fine particles on sides of cone, which may be done by stopping water flow and gently blowing air through stem of thistle tubes; clays should be deflocculated and fed into elutriator, drop by drop, and during this period velocity of flow should remain about one-third below maximum. Published by permission of Director, U. S. Bur. of Mines.

Stoneware. The Properties of Some Stoneware Clays, H. G. Schurecht. Dept. of Interior, Bur. of Mines, Technical Paper 233, 1920, 41 pp., 23 figs. Investigation had special reference to possible use of Ohio and Pennsylvania clays in making chemical stoneware.

Storing and Handling. The Storing and Handling of Raw Clays, T. W. Garve. Jl. Am. Ceramic Soc., vol. 3, no. 4, April 1920, pp. 266-285, 19 figs. Established practices.

Testing. A Direct Reading Overflow Volumeter, H. G. Schurecht. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 730-734, 3 figs. Designed by Ceramic Experiment Station of Bureau of Mines. Apparatus consists of glass bowl containing overflow tube sealed through bottom and extending into interior. Underneath is placed special burette graduated with reverse reading to catch and measure overflow.

Ultramicroscopic Examination. Ultramicroscopic Examination of Some Clays, Jerome Alexander. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 612-625. It is urged that thorough study of clays along lines of colloid-chemical principles and analysis be made in order to throw "light upon many obscure phenomena met with by those who use clay for ceramic and other purposes."

CLAYWORKING

Pug-Mill Control. Studies in Pug-Mill Control, H. Spurrier. Jl. Am. Ceramic Soc., vol. 3, no. 5, May 1920, pp. 388-403, 5 figs. It is shown microscopically that pugging causes a segregation of mineral constituents of a plastic body; method is shown for determination of working pressure of pug-mills.

CLEANING

See COMPRESSED AIR, Cleaning, Uses in.

CLIMATE

Control of. See METEOROLOGY, Climatic Control.

CLINOMETERS

Sanford. The Sanford Clinometer. Aerial Age, vol. 10, no. 17, Feb. 9, 1920, p. 634, 4 figs. Space between two glass hemispheres is filled with green tinted liquid. Inside inner hemisphere is miniature electric bulb which when lighted shows bubble in green liquid as white spot against green background.

CLOCKS

Electric. Electric Clocks (Dans l'horlogerie électrique), Léopold Reverchon. Industrie électrique, vol. 29, nos. 671 and 677, June 10 and Sept. 10, 1920, pp. 203-206, 8 figs., and 329-332, 4 figs. Schemes for automatic winding.

Errors in Precision Timepieces. Errors in Timepieces of Precision, E. P. Cotton. Surveyor (Sydney), vol. 32, no. 1, Feb. 28, 1919, pp. 10-16, 1 fig. Records of two clocks at Besançon observatory are given to illustrate variations of their daily mean rate.

CLUTCHES

Design. Clutch Design, H. M. Brayton. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 415-418, 4 figs. Also in Machy. (Lond.), vol. 15, no. 381, Jan. 15, 1920, pp. 489-492, 4 figs. Analysis of forces which must be considered in designing multiple disk, cone, and toothed clutches, and application of inclined plane principle to tooth form of solenoid-operated clutch.

Clutch Design and Spring Safety Clutches. Machy. (Lond.), vol. 16, no. 393, Apr. 8, 1920, pp. 15-18, 5 figs. Writer refers to previous article on this subject in same journal (Jan. 15, 1920), in which he claims that some of expressions and formulæ deduced are unreliable. Writer concludes that probably a spring is used more effectively when driving pressure difference is a minimum—that is, when spring has maximum number of coils possible, and when pressure is safe load when spring has its maximum compression.

[See also COUPLINGS, Flexible-Clutch.]

COAL

Analysis of. Notes on Coal Analysis, F. S. Sinnatt. Lancashire & Cheshire Coal Research Assn., Bul. No. 4, 1920, 38 pp., 2 figs. Bulletin

prepared for information of members of Coal Research Association. Writer is director of research to association. Special attention is given to purchasing coal upon scientific foundation.

Ash, Fusibility of. Fusibility of Coal Ash from Eastern Coals, W. A. Selvig, D. C. Brown and A. C. Fieldner. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 80-81. Table giving results of tests of standard mine samples collected by representatives of Bureau of Mines, U. S. Geol. Survey, or by various State Geol. Surveys, according to methods used by Bureau of Mines.

Temperatures at which Ash from Western Coals Fuses to a Sphere, W. A. Selvig, L. R. Lenhart and A. C. Fieldner. Coal Age, vol. 18, no. 14, Sept. 30, 1920, pp. 677-682, 5 figs. Tables giving results obtained for western coals including those from Alaska, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming.

Bituminous, Banded. The Behaviour of the Constituents of Banded Bituminous Coal on Coking. Studies in the Composition of Coal, Rudolf Lessing. Jl. Chem. Soc., vol. 117 & 118, no. 689, March 1920, pp. 247-256, 4 figs. Experimental investigations of behavior of samples of fusain, durain, clarain and vitrain upon coking. Investigation was directed to ascertain distinctions exhibited by solid coking residues.

The Mineral Constituents of Banded Bituminous Coal. Studies in the Composition of Coal, Rudolf Lessing. Jl. Chem. Soc., vol. 117 & 118, no. 689, March 1920, pp. 256-265. Results of examination of ash contents of fusain, durain, clarain, and vitrain, particularly with a view to determining rôle played by ash content of coal during its carbonization.

Bituminous, Composition of. Compilation and Composition of Bituminous Coals, Reinhardt Thiessen. Jl. of Geology, vol. 28, no. 3, Apr.-May, 1920, pp. 185-209, 44 figs. on 9 supp. plates. Bituminous coals are said to consist of alternate layers of "bright" coal and "dull" coal; the bright coal is called anthraxylon, and retains its original woody structure, although often somewhat distorted; dull coal consists of numerous small layers or chips of bright coal embedded in a dull matrix, the attritus. Sources from which dull coal was derived are enumerated.

Bituminous, Low-Temperature Carbonization. Making the Smokiest Coal Smokeless While Saving By-products, George Esherick, Jr. Coal Age, vol. 18, no. 6, Aug. 5, 1920, pp. 275-277, 3 figs. Advocates treating bituminous coal by Smith process of low-temperature carbonization. Paper read before Kentucky Min. Inst.

Prospect That Soon no Coal Will be Used without Preliminary Devolatilization, George Esherick, Jr. Coal Age, vol. 18, no. 7, Aug. 12, 1920, pp. 327-330, 5 figs. Progress being made in commercial manufacture of devolatilized coal. Paper read before Kentucky Min. Inst.

Bituminous, Production of. Is the Coal Shortage Real or Imaginary? C. E. Lesher. Coal Age, vol. 18, no. 9, Aug. 26, 1920, pp. 429-431, 1 fig. Deals only with bituminous coal. It is said that stocks are lowest in five years, that present rate of production is barely sufficient for consumption and exports and that inequalities in production and distribution make necessary an output of 11,500,000 tons per week if serious condition this winter is to be forestalled.

Bituminous, Stored. See Temperature Indicator.

Bituminous, Washing Tests of. Washing Tests of a Bituminous Coal, H. F. Yancey and Thomas Fraser. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 32-36, 3 figs. Tests made in laboratories of University of Ill. to determine methods for washing clover-run coal from Mahaffy, Pa.

Breakers. See COAL BREAKERS.

Briquetting. Coal Briquetting and Conservation, P. A. N. Seurot. Jl. Eng. Inst. of Canada, vol. 2, no. 12, Dec. 1919, pp. 758-769, 9 figs. Data showing savings which can be realized by using coal screenings, account of experiments made at French plant to determine cohesion of briquets, and description of various presses for manufacturing briquets.

Commercial Carbocoal Plant Operating, M. M. Brandegee. Black Diamond, vol. 65, no. 4, July 24, 1920, pp. 76-78, 5 figs. Description of plant at South Clinchfield, Va., operated for the Government. Largest plant in world combining practical application of low carbonization of coal and briquetting of fuels.

Fuel Briquetting in 1919, F. G. Tryon. Dept. of Interior, U. S. Geological Survey, 1920, pp. 33-36, 1 fig. Statistics of production. There were briquetted 295,734 tons of fuel in 1919 in U. S. List is included of briquetting plants in U. S.

Good Briquets Made of Oklahoma Coal with Crude-Oil Residue as a Binder, J. C. Davis. Coal Age, vol. 18, no. 9, Aug. 26, 1920, pp. 443-444. Briquets in tests did not smoke more than coal from which they were made and burned readily. They did not soften, disintegrate or fall through grate. Washed-coal briquets did not clinker; those from unwashed coal did. Former had heat content of 12,570 B.t.u., while washed coal from which they were made ran 12,200 B.t.u.

Some Investigations in Briquetting Oklahoma Coal, J. C. Davis. Chem. and Metallurgical Eng., vol. 23, no. 3, July 21, 1920, pp. 101-102. Tests conducted at Oklahoma University showed that certain Oklahoma soft coals can be successfully briquetted, make cleaner domestic fuel than ordinary bituminous coals, and stand handling and rough usage to a remarkable degree. Abstract from paper presented before chemists and engineers' meeting at Tulsa, Okla.

See also Low-Temperature Carbonization.

Brown. See LIGNITE.

Bunkering. British Bunkering and Handling Methods, H. Hubert. Coal Trade Jl., vol. 50, no. 47, Nov. 19, 1919, pp. 1341-1342, 2 figs. Typical systems of bunkering coal from lighters and handling in storage yards.

Bunkers. See COAL BUNKERS.

Caking Value. A New Characteristic For Coal: The Agglutinating Power Curve, F. S. Sinnatt, A. Grounds. Jl. Soc. Chem. Industry, vol. 39, no. 7, April 15, 1920, pp. 83T-86T, 1 fig. Experimental study of influence of degree of fineness of powdered inert matter on caking property of coal. It was found that fundamental property of caking, which varies considerably in different coals, is influenced by degree of fineness of inert substance until, when inert material, finer than 1/90 mesh is taken, caking property of coal may be entirely destroyed by less than its own weight of inert matter.

Calorimeters. See CALORIMETERS, Coal.

Calorimetry of. See CALORIMETERS, Coal.

Carbonization. Progress in Coal Carbonization since 1916, J. A. Brown. Gas Age, vol. 44, no. 11, Dec. 1, 1919, pp. 475-477. General report of Carbonization Committee of Am. Gas Assn. and special reports on installations.

The Transition from Coal to Coke, Eric Sinkinson. Jl. Chem. Soc., vols. 117 & 118, no. 693, July 1920, pp. 839-843. Account of

experiments on the corbonization of coal from which it was concluded that decomposition of coal begins at 450 deg. cent. and continues to 500 deg. cent., at which temperature sufficient free carbon has been liberated to form conducting bridge in coal.

See also Low-Temperature Carbonization.

Chemical Constitution. Recent Discoveries Concerning Chemical Constitution of Coals (Les découvertes récentes sur la constitution chimique des charbons), Hector Pouleur. Revue Universelle des Mines, vol. 2, no. 3, July-Aug. 1919, pp. 535-552. Present knowledge is summarized as follows: Free carbon is not contained in coal but carbon is present in composition with hydrogen, oxygen, nitrogen and sulphur compounds; solvents permit extraction from coal of some of its constituents in their original form; distillation in vacuum furnishes important tars.

Coking. An Investigation of Coking Coals, S. R. Illingworth. Colliery Guardian, vol. 119, no. 3102, June 11, 1920, pp. 1641-1642, 8 figs. It is stated that degree of plasticity in coal is conditioned by amount of resinic matter present, melting point and point of complete fluidity of resinic constituents, temperature to which coal is subjected, and proximity of that temperature to point of decomposition of resinic constituents. Hardness of coke is said to be determined by two factors, namely, total amount of cementing material in coke, and distension of cementing material. Abstract of paper read before Soc. Chem. Industry.

Researches on Coal, S. Roy Illingworth. Jl. Soc. Chem. Industry, vol. 39, no. 10, May 31, 1920, pp. 133T-138T, 6 figs. Investigations of coking coals. Theory of coking is suggested from results obtained in experiments. Special attention is given to qualities of coke obtained from coking at various temperatures and at different coking times.

See also Bituminous, Banded.

Conservation. A National Policy of Coal Conservation. Jl. Roy. Soc. Arts, vol. 67, no. 3492, Oct. 24, 1919, pp. 751-760. Advocates free-trade national coal research policy as means for preserving coal resources of Great Britain.

Coal and Its Conservation, William Arthur Bone. Jl. Roy. Soc. Arts, vol. 67, no. 3491, Oct. 17, 1919, pp. 737-743. Economic importance of coal, with reference to present coal-mining labor conditions in England.

Coal Conservation, Dugald Clerk. Iron & Coal Trades Rev., vol. 99, no. 2696, Oct. 31, 1919, pp. 562-563. Relative efficiencies of gas and electricity.

Coal Conservation and Electric Power Supply, William Arthur Bone. Jl. Roy. Soc. Arts, vol. 67, no. 3493, Oct. 31, 1919, pp. 765-772. Conservation of natural resources demands, in opinion of writer, (1) that power be generated preferably from low-grade coals burnt under expert supervision in large boilers with high pressures and super-heat; (2) that electricity be generated in large turbo-cylinders; and (3) that it be distributed as high-tension current through public mains over radius up to 29 miles from generating stations.

Coal Conservation in the United Kingdom, Dugald Clerk. Engr., vol. 129, no. 3356, April 23, 1920, pp. 418-420, 1 fig. Also in Engineering, vol. 109, no. 2834, April 23, 1920, pp. 543-545, 1 fig. Figures showing comparative thermal efficiency of production of gas and electricity. Writer does not believe it is desirable to effect electric generation and distribution of power, light and heat by means of great super-stations. In his opinion development of power and light generation should freely proceed in competition. Paper read before Inst. Thermal Engrs. and Instn. Civil Engrs.

Conservation Through Engineering, Franklin K. Lane. U. S. Geol. Survey, Dept. of the Int., Bul. 705, 35 pp. Conditions under which utilization of natural resources, particularly coal, is demanded are outlined, and a program is recommended which calls for cooperation of engineers and legislators in securing proper distribution of coal throughout the nation.

Rational Use of Coal for Power and Heat, John Blizard. Can. Min. Inst. Bul., no. 92, Dec. 1919, pp. 1214-1221. Possibilities of carbonizing or complete gasifying of coal and supplying consumers with gas and coke instead of raw coal.

Deposits. See COAL DEPOSITS.

Distillation. See COAL DISTILLATION.

Dust. See COAL DUST.

Economic Selection of. Economic Selection of Coal, A. L. Booth. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 1a, 9 pp., 16 figs. on supp. plate. Photomicrographic studies of coal and conclusions as to their suitability for various kinds of work. Only coals in commercial use in England are considered. It is determined, for example, that Humic coals, which contain fair proportion of cuticle or spores, are most suitable for steam raising.

Fixed Carbon Content and Petroleum. Carbon Ratios in Carboniferous Coals of Oklahoma, and Their Relation to Petroleum, Myron L. Fuller. Economic Geology, vol. 15, no. 3, April-May 1920, pp. 225-235, 1 fig. Reference is made to theory advanced by David White concerning relation between percentage of fixed carbon in pure coal and presence of oil in region in which coal occurs. Map is shown with lines separating areas in which there is possibility of oil being present from regions in which there is no such possibility.

Formation. Nature of Coal, J. E. Hackford. Min. & Metallurgy, no. 163, July 1920, pp. 35-36. A theory as to mode of formation and nature of coal is put forward and compared at same time, for sake of clearness, with mode of formation of oil. (Abstract.)

Frozen, Thawing. Increasing Coal Storage to Ninety-Day Supply, William M. Crowe. Fire & Water Eng., vol. 67, no. 24, June 16, 1920, pp. 1315 and 1318, 2 figs. It is stated that water bureau of Philadelphia adopts plan against former thirty-day supply. Description of melting sheds used for thawing frozen coal.

Fusain in Coal Dust. Coal Dust and Fusain, F. S. Sinnatt. Lancashire & Cheshire Coal Research Assn., bul. 5, 1920, 19 pp. Research work conducted to determine composition of fusain and amount present in dust produced during working of coal at colliery.

Gasification. The Complete Gasification of Coals (Die restlose Vergasung der Kohlen), K. Rummel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 30, July 24, 1920, pp. 565-570. Notes on power-plant problems in the gas industry with recovery of by-products; use of tar-free gas in industrial furnaces; future aspect of fuel economy; gas producers and their operation; properties and utilization of tar; etc.

Great Britain. Fuel Economy, A. E. A. Edwards. Jl. and Trans., Soc. of Engrs., vol. 11, no. 5, 1920, pp. 140-155, 1 fig. Discusses annual output of coal in Great Britain and coal consumption. Author shows how waste heat may be utilized. Paper read before Wolverhampton and District Engineering Society.

Handling. See COAL HANDLING.

Industry. See COAL INDUSTRY.

Iowa and Illinois. Early Purchase and Storage of Iowa Coal, L. C. Hodson. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 16, no. 35, Jan. 30, 1918, 8 pp. Urges early purchase and storage of coal by domestic consumers in order to maintain steady mining transportation.

Locomotive Tests with Iowa and Illinois Coals. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 15, no. 34, April 20, 1917, 40 pp., 16 figs. Object of investigation was to determine relative values of Iowa and Illinois coals under certain prescribed conditions. Proximate and calorific analyses showed little difference on dry basis, but Iowa coal contained more moisture than Illinois coal. Pounds of ash and refuse were higher with lower percentage of carbon for runs with Illinois coal. Boiler and grate efficiency was higher with Iowa than with Illinois coal. All averages of other factors of boiler and engine performance based upon coal fired show more favorable results with Iowa coal.

Japan. A Fundamental Study of Japanese Coal, Chôzô Iwasaki. Technology Reports, Tôhoku Imperial Univ., vol. 1, no. 2, 1920, 35 pp., 53 figs. on supp. plates. Chemical and geological notes.

Coal Production, Trade, Consumption, H. T. Goodier. Coal Industry, vol. 3, no. 6, June 1920, pp. 266-267. Japanese industry. From Commerce Reports.

Low-Temperature Carbonization. Low-Temperature Carbonization of Coal and Manufacture of Smokeless Fuel Briquets, Harry A. Curtis. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 499-501, 3 figs. Low-temperature carbonization of coal compared with high-temperature carbonization. The "carbocoal process," retorts, machinery, etc., installed at the Clinchfield plant.

Meters. See COAL METERS.

Mines. See COAL MINES.

Mining. See COAL MINING.

Pennsylvania. How the "Grand Push" Determined Present Character of Pennsylvania Coals, George H. Ashley. Coal Age, vol. 17, no. 26, June 24, 1920, pp. 1307-1310, 2 figs. Relation of quality to geographic location. Study based on geological considerations.

Permeability to Gases. The Permeability of Coal to Gases, J. Ivon Graham. Trans. Instn. Min. Engrs., vol. 58, no. 1, Nov. and Dec. 1919, pp. 32-38 and (discussion) pp. 38-39. Results of experiments.

Piles, Temperature in. See Temperature Indicator.

Powdered. See PULVERIZED COAL.

Production. The Coal Situation from the Operators' Point of View, J. D. A. Morrow. Heat. & Vent. Mag., vol. 16, no. 11, Nov. 1919, pp. 25-30. Survey made shortly before inauguration of coal strike. Paper presented at annual convention of National Assn. of Purchasing Agents.

Production, Hookworm Disease and. Hookworm Disease and Coal Production, J. B. Burroughs and Wilbur Greely Burroughs. Coal Industry, vol. 3, no. 5, May 1920, pp. 231-233. Former installments gave instances in which disease affected coal production and described its ravages if permitted to spread. Methods of destroying it are given in this installment and it is stated that careful attention to details will ultimately result in almost complete eradication of disease, as has been demonstrated in mines of Germany, Belgium and the Netherlands.

Pulverized. See PULVERIZED COAL.

Purchasing on Specifications. Purchase of Coal on Specifications, John Howatt. Jl. Western Soc. Engrs., vol. 24, no. 9, Nov. 1919, pp. 535-552 and (discussion) pp. 553-556. Method is outlined for purchasing coal on B.t.u. basis. System provides definite basis for cancellation of contract.

Pyrite, Use of. Some Chemical Data on Coal Pyrite, H. F. Yancey. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 105-109, 3 figs. Study of use of coal pyrite for manufacture of sulphuric acid. Analyses of coal pyrite samples for sulphur, carbon, arsenic, phosphorus.

Research. Research upon the Chemistry of Coal and Combustion, William A. Bone. Combustion, vol. 3, no. 3, Sept. 1920, pp. 24-25. Urges establishment of national policy with regard to research upon chemistry of coal and combustion and points out how such policy could be carried out in best interests both of progress in science and economic development of coal fields.

Researches on Coal and Gases Obtained by Its Distiilation (Recherches sur la houille et les gaz provenant de sa distillation), Leo Vignon. Annales de Chimie, vol. 13, no. 9, May-June 1920, pp. 284-301. Studies comprise (1) coal solvent, (2) composition of gases obtained by distillation of coal at different temperatures, (3) influence of composition of coal on proportions of carbon oxide and carbonic acid present in coal gas, and (4) elimination of carbon oxide from coal gas.

Sampling. Shipping American Coals to Switzerland, with Sampling Methods in Use, Joseph D. Davis. Coal Age, vol. 18, no. 7, Aug. 12, 1920, pp. 334-338, 10 figs. Methods of sampling here and abroad, with information regarding Swiss requirements. Description of handling of coal by Northern, or German, route to Switzerland. Why American coals have difficulty in finding welcome equal to that given to known European fuels.

The Sampling of Coal, F. S. Sinnatt. Lancashire and Cheshire Coal Research Assn., bul. 2, 1919, 20 pp. Deals with principle underlying sampling and possible errors; weight of sample, taking of sample, treatment of gross sample and mechanical sampling. Includes chief part of Board of Trade leaflet on coal sampling.

Smokeless. See BITUMINOUS COAL, Low-Temperature Carbonization.

Spontaneous Combustion. The Constitution of Coal in Relation to Its Spontaneous Combustion, F. V. Tideswell. Proc. South Wales Inst. of Engrs., vol. 36, no. 1, July 16, 1920, pp. 183-258, 4 figs. Also in Colliery Guardian, vol. 119, no. 3104, June 25, 1920, pp. 1789-1791. Survey of experimental results found by various investigators. Bibliography of articles on the subject is appended.

Spontaneous Ignition. A Method of Determining the Relative Temperatures of Spontaneous Ignition of Solid Fuels, F. S. Sinnatt and Burrows Moore. Jl. Soc. Chem. Industry, vol. 39, no. 6, March 31, 1920, pp. 72T-78T, 8 figs. Experiments planned (1) to determine relative tendencies to spontaneous ignition in oxygen of certain finely powdered fuels; (2) to examine influence of degree of fineness of particles on temperature recorded; and (3) to examine influence of volatile matter upon temperature recorded. Apparatus consisted of heavy cast-iron vessel in which enclosed nickel crucible could be raised to any desired temperature.

Storage. See also Bituminous, Storage of; COAL STORAGE.

Striped. Striped Coals, H. Winter. Colliery Guardian, vol. 119, no. 3081, Jan. 16, 1920, pp. 172-173. Results of microscopical examination and chemical analysis of various samples.

Structure. Constitution of Coal Through a Microscope, Reinhardt Thiessen. Coal Indus., vol. 2, no. 12, Dec. 1919, pp. 558-563, 10 figs. Microphotographs of Illinois, Indiana, Pittsburgh and Alabama coals.

Sulphur in. A Study of the Forms in Which Sulphur Occurs in Coal, A. R. Powell and S. W. Parr. University of Illinois Bul., vol. 16, no. 34, Apr. 21, 1919, 66 pp., 3 figs. Investigation to determine relationship between amounts of various sulphur forms in coal and residual sulphur left in coke and also nature of sulphur retained in coal.

Determination of Sulphur Forms in Coal, Alfred R. Powell. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 887-890. It was found experimentally that method of Powell and Parr gives correct and accurate results. Changes are suggested in method for rapid routine work.

Occurrence and Origin of Finely Disseminated Sulphur Compounds in Coal, Reinhardt Thiessen. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 668-673, 10 figs. Presence of sulphur in coal, either as sulphur balls or lenses or as minute particles scattered throughout mass, attributed to sulphur originally contained in plant matter from which coal has been evolved.

Testing. Commercial Coal Testing, J. Devlin. Elec. Rev. (Lond.), vol. 85, no. 2193, Dec. 5, 1919, pp. 709-710. Routine operations carried out in laboratory of large electricity-supply undertaking.

Temperature Indicator. Temperature Indicator for Soft Coal in Storage. Iron Age, vol. 106, no. 10, Sept. 2, 1920, p. 588, 2 figs. Coalometer, device for indicating temperature of bituminous coal pile at various depths.

Thermal Decomposition, Low-Temperature. Thermal Decomposition of Coal at Low Temperatures, S. Roy Illingworth. Colliery Guardian, vol. 119, no. 3099, May 21, 1920, pp. 1441-1443. Results of investigation are said to show that decomposition of coals at temperatures up to 450 deg. cent. results in destruction of pyridine-soluble constituents of coal substance; two types of beta-cellulosic and resinic compounds occur in each of coals examined, one type is readily decomposed at 450 deg. cent. and other type is comparatively stable at this temperature; nitrogenous compounds in coal are destroyed; sulphur compounds are more readily decomposed in highly bituminous than in less bituminous coals, etc.

See also Research.

Researches on Coal, S. Roy Illingworth. Jl. Soc. Chem. Indus., vol. 39, no. 9, May 15, 1920, pp. 111T-118T, 7 figs. Also in Proc. South Wales Inst. of Engrs., vol. 36, no. 1, July 16, 1920, pp. 23-86, 20 figs. Thermal decomposition of coal at low temperatures. It was found that decomposition of coals at temperatures up to 450 deg. cent. results in destruction of pyridine soluble constituents of coal substance.

Tipples. See COAL TIPPLES.

Volatile Matter, Neutralizing. The Influence of the Addition of Inert Matter upon the Volatile Matter Involved When Coal Is Heated, F. S. Sinnatt and A. Grounds. Lancashire & Cheshire Coal Research Assn., bul. 3, 1919, 14 pp., 3 figs. It is suggested that curves obtained by method described may serve as an additional "characteristic" for coal, and results of study may also be of interest in connection with subject of stone dusting of mines.

Washing. See COAL WASHING.

Waste, Utilization of. Utilisation of Waste Coal. Iron & Coal Trades Rev., vol. 100, no. 2726, May 28, 1920, p. 741. Abstract from report by sub-committee of Advisory Board of Industry & Sci. for investigating possibilities of utilizing waste coal in South Africa.

Weighing. See COAL WEIGHING.

COAL BINS

See COAL POCKETS.

COAL BREAKERS

Anthracite. How an Anthracite Breaker Was Remodeled, Dever C. Ashmead. Coal Age, vol. 17, nos. 11 and 12, Mar. 11 and 18, 1920, pp. 483-486, 8 figs., and 532-535, 2 figs. Mar. 11: How concrete was largely substituted for wood during operation of breaker. Mar. 18: Adoption of web preparation on account of its claimed greater simplicity and efficiency.

New Type. An Anthracite Breaker That Is Different, Dever C. Ashmead. Coal Age, vol. 17, no. 21, May 20, 1920, pp. 1039-1042, 4 figs. Features quoted as distinctive are separation of rock outside main breaker, special type of shaker screen, combination of mechanical pickers and jigs and system of motor drive controlled from central point.

Pennsylvania. Price-Pancoast Breaker Relies on Gravity to Do Much of the Work, Dever C. Ashmead. Coal Age, vol. 17, no. 18, April 29, 1920, pp. 841-844, 5 figs. Installation of coal company in Pennsylvania where only two conveyors are installed, one for handling condemned coal and one for handling rock. Coal is conveyed by gravity.

Wooden Construction. Modernized Breaker with Hand Pickers, Spirals, Jigs and Concentrators, D. C. Ashmead. Coal Age, vol. 18, no. 12, Sept. 16, 1920, pp. 585-589, 7 figs. Wooden construction breaker at Silver Creek Colliery of Philadelphia & Reading Coal & Iron Co.

COAL BUNKERS

Concrete. Cement Clinker and Coal Bunkers at Newmains, N. B. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, page 108-110, 2 figs. Bunkers for storage capacity of 1000 tons of clinker and were constructed on Mouchel-Hennebique system of ferro-concrete.

Reinforced Concrete Bunkers and Water Tower. Concrete & Constructional Eng., vol. 15, no. 1, Jan. 1920, pp. 33-41, 9 figs. Details of 1000-ton coal storage bunker, 1000-ton mixing bunker, 55,000-gal. water-tower, water softening tower, breeze bunker, and shale bunker.

COAL DEPOSITS

French Indo-China. Coal in French Indo-China. Min. Mag., vol. 21, no. 5, Nov. 1919, pp. 307-309, 1 fig. Account of coal deposits in Tonkin. From Far Eastern Rev., Shanghai.

Ireland. An analysis of the Palæozoic Floor of North-East Ireland, with Predictions as to Concealed Coalfields, W. B. Wright. Sci. Proc. of Royal Dublin Soc., vol. 15, no. 45, Oct. 1919, pp. 629-650, 2 figs., 1 on supp. plate. It is pointed out that there are three principal areas where coal-bearing strata may be expected to occur. Communicated by permission of Director of Geol. Surv. of Ireland.

Kentucky. Development of Kentucky Field, 1919, W. B. Webb. Coal Industry, vol. 3, no. 2, Feb. 1920, pp. 99-100. Opinion is advanced

that Elkhorn field will soon become the great coal producing section of country.

Lematang. Scientific, Technical and Economical Importance of the Lematang Coal Deposits (De wetenschappelijke en technisch-economische beteekenis der Lematangkolenvelden), H. Tromp. Ingenieur, vol. 34, no. 42, Oct. 18, 1919, pp. 767-774, 14 figs. Exploration and exploitation of Boekit-Asem deposits. Showing geologic formations, chemical properties and calorific values of coal. Paper read before Kon. Institut van Ingenieurs.

Missouri. Curious Coal Deposits in Missouri, Walter M. Brodie. Coal Age, vol. 16, no. 22, Dec. 11 and 18, 1919, pp. 876-881, 19 figs. Deposits containing both cannel and bituminous coal as well as small quantities of zinc. Writer believes that their thickness and quality as well as small amount of overburden covering them makes their operation particularly attractive as stripping proposition.

Ohio. The Coal Fields of the United States—The Coal Fields of Ohio, J. A. Bownocker. Department of the Interior, U. S. Geol. Survey, professional paper 100-B, Oct. 29, 1917, 62 pp., 54 figs., 1 on supp. plate. General features of coal beds in Pottsville, Allegheny, Conemaugh, and Monongahela formations. Composition and use of Ohio coals. A computation of original coal content of the fields, by Frank R. Clark, is appended.

Shantung, China. Coal Fields and Resources of Shantung, Wilbur Greely Burroughs. Coal Industry, vol. 3, no. 2, Feb. 1920, pp. 79-82. Reserves of field are estimated at 1,360,000,000 metric tons of anthracite and 1,360,000,000 metric tons of bituminous coal.

United States. The Coal Fields of the United States—General Introduction, Marius R. Campbell. Department of the Interior, U. S. Geol. Survey, professional paper 100-A, Feb. 24, 1917, 33 pp., 4 figs., 1 on supp. plate. Notes on ranks of coal and comparison of different ranks; classification of the coal areas; production and original tonnage of coal; and analyses of representative coals.

Virginia. The Geology and Coal Resources of the Coal-Bearing Portion of Tazawell County, Virginia, T. K. Harnsberger. Virginia Geol. Survey, Univ. of Virginia, bul. no. 19, 1919, 195 pp., 17 figs. Total area of coal land is estimated to be 696.5 sq. miles.

COAL DISTILLATION

By-Products from. By-Products from Coal Distillation (L'extraction des différents produits de la distillation de la houille), A. Grebel. Génie Civil, vol. 77, no. 8, Aug. 21, 1920, pp. 148-153, 3 figs. Processes and installations of the Société du Gaz de Paris.

Extraction of Different Products from Distillation of Coal. Process and installations of the Société du Gaz de Paris (L'extraction des différents produits de la distillation de la houille. Procédés et installations de la Société du Gaz de Paris), A. Grebel. Génie Civil, vol. 77, no. 9, Aug. 28, 1920, pp. 165-170, 13 figs. Recuperation of naphthalene and benzol.

Recovery of By-Products of Coal Distillation in Steam Power Plants (Die Gewinnung von Nebenprodukten der Kohlendestillation in Dampfkraftwerken), K. Wilkens. Elektrische Kraftbetriebe u. Bahnen, vol. 17, no. 30, Oct. 24, 1919, pp. 233-235, 1 fig. Most important condition for low-temperature tar recovery is said to be even heating of coal to be distilled at 400 to 500 deg. cent. and prevention of any overheating, as well as prompt removal of distilled products from hot zone. Describes distillation process evolved by writer, by which, it is claimed, only part of coal which is lost is the low-temperature tar removed from boiler furnace, whereas the gas product as well as remaining semi-cokes are fed to furnace.

Low-Grade Coal. Sub-Bituminous and Lignite Coals, S. M. Darling. Ry. Rev., vol. 66, no. 26, June 26, 1920, pp. 1096-1098. Economic possibilities of applying distillation methods to large quantities of sub-standard fuels, deposited in various parts of United States. Paper read before International Railway Fuel Association.

Rotating, Furnaces for. The Distillation of Coal in Rotating Furnaces (Die Entgasung der Kohle im Drehofen), E. Roser. Stahl u. Eisen, vol. 40, no. 22, June 3, 1920, pp. 741-747, 5 figs. Summarizes results obtained by separation of distillation from gasification in gas-producer operation with recovery of by-products. It is claimed that by extensive recovery of by-products from coal, shales, etc., a great part of heating and lubricating oils used in Germany will, in a few years, be produced from her own coal supplies.

COAL DUST

Explosions. Coal Dust Explosions, L. D. Tracy. Iron Age, vol. 105, no. 11, Mar. 11, 1920, pp. 735-736. Results of investigations of hazards from partially consumed fuel. Preventive precautions are suggested.

Explosions and Preventive Measures, I. C. Parfitt. Coal Industry, vol. 3, no. 3, Mar. 1920, pp. 153-157, 3 figs. Coal-dust explosion is described as gas explosion. Remedies suggested are stemming with inert substances, maintaining working places as free of dust as possible, precipitation of float dust, and use of inert dust to surround expelled flame.

Explosion Hazard in Steel Mills from Partly Consumed Coal Dust. Chem. & Met. Eng., vol. 22, no. 9, March 3, 1920, pp. 422-423. Example is quoted of metal plant where there were a number of puddling furnaces, some of which used pulverized coal as fuel. Draft of air blew some of coal dust over red-hot iron. Dust immediately ignited and communicated flames to roof trusses.

Inflammability of. A Few Notes on Coal-Dust Experiments, R. W. Anderson. Trans. Instn. Min. Engrs., vol. 59, no. 3, July 1920, pp. 256-261 and (discussion) 262-263, 1 fig. Description of investigation carried out in coal mine to determine condition of roads.

Notes on an Explosion of Coal Dust at Pennant Hill Colliery, Near Dudley, Worcestershire, J. R. Felton. Trans. Instn. Min. Engrs., vol. 58, part 2, Jan. 1920, pp. 111-115 and (discussion) pp. 115-117, 3 figs. Explosion is believed to have been due to coal dust initiated by a blown-out shot at manhole.

Steel Mill Coal Dust Explosion Hazards, L. D. Tracey. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 147-148. Results of tests and investigations made by U. S. Bur. of Mines in ascertaining liability of coal dust causing explosions.

Inflammability of Coal Dust Found in Mine Galleries (Note sur des expériences relatives au classement des gisements de poussieres), J. Taffanel. Annales des Mines, vol. 9, no. 2, 1920, pp. 93-115, 5 figs. Experiments are reported in which effect on inflammability of quantity and fineness of dust and volatility and ash contents of coal was determined. Scheme is suggested for measuring in mine laboratory degree of inflammability of coal dust mixture.

COAL GAS

Adding Water Gas to. Advantages and Disadvantages of Adding Water Gas to Illuminating Gas (Avantages et inconvénients de l'adjonction

du gas à l'eau au gaz d'éclairage), H. Pfeiffer. Journal des Usines à Gaz, vol. 44, nos. 16 and 17, Aug. 20 and Sept. 5, 1920, pp. 253-255 and 266-271. Conference delivered before Union of Gas and Water Technicians of Saxony and Thuringia. From Journal für Gasbeleuchtung.

Efficiencies in Use of Different Grades. Efficiencies in Use of Different Grades of Gas. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 488-492. Report of Research Committee of Gas Investigations Committee, Instn. of Gas Engrs. It deals with illuminating power and thermal efficiency attainable with low-pressure upright incandescent burner and different grades of gas.

Heating-Value Indicator. New Heating Value Indicator, Edward J. Brady. Am. Gas Light Assn. Monthly, vol. 2, no. 7, July 1920, pp. 445-456, 13 figs. Account of origin and development of new instrument for determining heating value of certain illuminating gases, by means of which a determination of heating value may be made in few minutes with accuracy of between 1 and 2 per cent, and can be made by person having very little calorimetric experience. Bunsen flame characteristics are described with aid of charts. Paper read before Am. Gas Assn. and awarded Beal medal as best technical paper at 1919 Convention.

Inerts in. Inert Products in Coal Gas. Times Eng. Supp., no. 537, July 1919, p. 224. Origin and methods of avoiding.

Tar Content. Determination of the Amounts of Tar and Gas and the Heat Value of Gas in Gasification (Ueber die Ermittlung der Teerund Gasmenge, sowie des Gasheizwertes bei Vergasungen), Deinlein. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 16, Aug. 31, 1919, pp. 128-130. Discussing amount of tar, composition of coal and tar, amount of gas and heat value.

Determination of Tar in Gas, C. H. Stone and N. F. Prince. Gas Age, vol. 45, no. 12, June 25, 1920, pp. 531-553, 2 figs. Description of method and apparatus devised and used by authors for making tests in laboratories of Rochester Gas & Elec. Corporation, and results obtained.

Use as Automobile Fuel. See AUTOMOBILE FUELS, Gas.

COAL HANDLING

Automatic Tub Tipping. Automatic and Continuous Tipping of Colliery Tubs, A. Hermes. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 796-797, 2 figs. Advantages of system of continuous tipping are pointed out. Translated from Fördertechnik.

Boiler Plants. Coal Handling Features New Boiler Plant. Iron Age, vol. 105, no. 5, Jan. 29, 1920, pp. 321-324, 5 figs. Crushed fuel transported from a wharfage storage basin by tunnel conveyor, bucket elevator, belt and shuttle conveyors to bunkers.

See also Old Hickory Powder Plant.

British Methods. British Methods of Coal Handling, George Frederick Zimmer. Coal Trade Jl., vol. 50, nos. 45 and 46, Nov. 5 and 12, 1919, pp. 1287-1289 and 1316-1318, 4 figs. Nov. 5: Lesser distances require smaller sizes of trucks compared to those in America and methods of handling are adapted to tender physical nature of English coal. Nov. 12: Accumulation of coal by means of a telepher.

Car Dumpers. See CAR DUMPERS.

Chain Haul. After Quarter Century Simple Chain Haul Is Still Doing Efficient Work, D. C. Ashmead. Coal Age, vol. 18, no. 11, Sept. 9, 1920, pp. 533-534, 3 figs. At Maltby Colliery work of decaging loads, caging empties and transferring both over 1000 ft. is performed by three men and chain haul. No device has been found that could supplant chain haul with profit.

Coaling Ships. Coaling Ships at Sea, H. Hubert. Coal Trade Jl., vol. 50, no. 49, Dec. 3, 1919, pp. 1393-1395, 3 figs. British floating coal depot used for storing large quantities of coal afloat.

Mechanical Coal Trimmers Solve Ship Loading Problem, Philip George Lang, Jr. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 412-414, 4 figs. Installation at Curtis Bay pier, Baltimore & Ohio Railroad.

Steamship Coaling Equipment. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 13-14, 2 figs. Self-contained coal digging unit intended for use in coaling ships through side ports.

The Michener System of Coaling Vessels, George Frederick Zimmer. Eng. & Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 729-732, 4 figs. Noted feature is that driving and delivery terminals are in permanent position relative to spot where coal is to be delivered into vessel.

Colliery Plant. Transportation and Preparation System at Nanty Glo, Donald J. Baker. Coal Age, vol. 17, no. 17, April 22, 1920, pp. 791-795, 5 figs. Cars are hauled from slope by hoisting engine, brought to foot house by locomotive, and elevated to tipple by chain haul. Cars are discharged one by one by revolving dump and coal is picked on ring-shaped picking tables.

Conveyors for. Belt Conveyor Fast Being Adopted for Coal Mine Service. Belting & Transmission, vol. 16, no. 12, June 20, 1920, pp. 25-28, 6 figs. Describes typical modern system, installed in Pike mine of Diamond Coal & Coke Co. at Brownsville, Pa., conveyor belt being 36 in. wide with 370-ft. centers, and operating at speed of 350 ft. per min.

Handling Coal by Using Belt Conveyors. Elec. World, vol. 75, no. 15, Apr. 10, 1920, pp. 835-838, 10 figs. Examples from installations now being completed in Middle West and East.

See also CONVEYORS, Apron-Type.

Electric Shovel. Electric Shovels for Handling Coal, H. W. Rogers. Coal Trade Jl., vol. 50, no. 53, Dec. 31, 1919, pp. 1505-1506. Notes on advantages and economies of electric shovel as compared with steam.

Equipment. Elevating and Conveying Equipment. Coal Trade Jl., vol. 50, no. 47, Nov. 19, 1919, pp. 1343-1344, 4 figs. Illustrating various kinds of equipment for handling coal and ashes.

G. E. Erie Works. Coal Handling at Erie Works Plant of General Electric Co., Henry J. Edsall. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 814-816, 5 figs. Equipment includes overhead bin over space in front of boilers with spouts direct to stoker magazines.

Great Lakes. Coal Handling on the Great Lakes, Garnault Agassiz. Coal Trade Jl., vol. 50, no. 35, Aug. 27, 1919, pp. 1045-1047, 2 figs. A sketch of lake coal business, with special reference to Canadian trade.

Installations. Novel Coal Handling at the McKeesport Tin Plate Company's Plant. Power, vol. 51, no. 5, Feb. 3, 1920, pp. 178-179, 4 figs. Coal is lifted from barges with clamshell bucket by locomotive crane and deposited in basin lying between dock wall and another wall parallel to it; track runs along center of basin and tunnel is built directly under track and communicating with storage space by means of slot running length of tunnel.

Labor-Saving Methods. Handling the Factory Coal Pile, Charles L. Hubbard. Factory, vol. 24, no. 9, May 15, 1920, pp. 1531-1536, 17 figs.

Writer points out that better ways of storing and distributing fuel usually involve less manual labor and more mechanical work, which means less expense and greater dependability, and describes coal-handling plans for many conditions.

Labor-Saving Methods of Handling Cars at Anthracite Shaft Stations, Dever C. Ashmead. Coal Age, vol. 17, no. 21, May 20, 1920, pp. 1052-1055, 5 figs. Equipment at mine of Silver Creek colliery of Philadelphia & Reading Coal & Iron Co.

Loading Machine. Coal Loader Based on a New Principle. Coal Age, vol. 17, no. 19, May 6, 1920, pp. 900-902, 3 figs. Joy loading machine. Machine is electrically driven and is 29½ ft. long, 5 ft. wide and 5 ft. high. Gathering mechanism consists of pair of gear fingers, the initial movement of which is forward into coal, after which there is raking motion across coal face, then rearward movement toward loading conveyor, then return to starting position.

Loading Pier. Design and Operation of Modern Car-Dump Coal Pier. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 759-762, 8 figs. Coal pier of C. R. R. of N. J., at Jersey City terminal, built to handle 400 cars per day, and equipped with two independently operated cardumpers. Reinforced-concrete girder trestles, it is stated, have proved more economical than steel.

New Design for Coal Loading Pier, W. L. Moffett. Mar. Rev., vol. 49, no. 12, Dec. 1919, pp. 567-569, 5 figs. Coal is taken from bin on car dumper apron by belt conveyors to four movable loading towers, from which it is delivered to vessels. Towers are capable of traveling up and down pier so that delivery point will be opposite any desired hatchway.

Locomotive Cranes. The Locomotive Crane in the Power Plant. Power Plant Eng., vol. 24, no. 12, June 15, 1920, pp. 599-601, 5 figs. Effects of using steam and electric locomotive cranes in handling coal supply.

Machinery. Developing High Overload Power Capacities. Coal Industry, vol. 3, no. 7, July 1920, pp. 332-334, 4 figs. Describes and illustrates results obtained by installing high duty boilers and proper machinery for handling coal, ashes and feedwater, favoring horizontally baffled boilers.

Mine Conveyors. Coal Face Conveyors, H. C. Jenkins. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 665-670, 3 figs. Describes various types of conveyors, including belt and shake conveyor, and deals with best conditions of working for each type. Question is taken up with reference to increased labor difficulties, particularly in mines, and it is pointed out that in installing conveyors methods of payment of men must be carefully gone into.

Minimum Breakage in. Lowering Splint Coal Down a Mountain with Minimum Breakage, Josiah Keely. Coal Age, vol. 17, no. 14, April 1, 1920, pp. 638-641, 6 figs. Degradation is avoided by causing coal to slide from car into tube, from tube into Monitor, from Monitor into another tube and from thence to conveyor.

Old Hickory Powder Plant. Coal Handling Equipment of the "Old Hickory" Powder Plant, Henry J. Edsall. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 36-41, 5 figs. Describes coal handling equipment designed to convey 5000 tons per day to boilers and to care for outside ground storage of 100,000 tons.

Plants. An Efficient Coal and Ash Handling Plant, Henry J. Edsall. Coal Trade Jl., vol. 51, no. 3, Jan. 21, 1920, pp. 77-78, 2 figs. Installation using Peck overlapping pivoted bucket carrier to distribute fuel and take away ashes.

An Interesting Installation of Coalhandling Equipment. Power Plant Eng., vol. 24, no. 11, June 1, 1920, pp. 557-558. Installation at United States War Department's Old Hickory Smokeless Powder Plant, Nashville, Tenn. Total storage capacity is 100,000 tons and conveyors can handle maximum of 600 tons per hour from storage to bunkers.

Coal-Handling Plant (Kohlenstapelanlage), H. Hermanns. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, no. 7, Feb. 13, 1920, pp. 50-54, 5 figs. Description of coal-handling plant of a Silesian coal mine, main feature of which is said to be a new and rapid type of car dumper with uninterrupted through track. The dumped coal is stored in elevated bins and handled by means of link-belt conveyor.

Coal Handling Plant and Store of the "Old Hickory" Powder Mill, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 25, June 17, 1920, pp. 789-792, 3 figs. Plan and details of 100,000-ton coal-storage plant.

Efficient Handling Plant at Alicia Mines No. 1. Coal Trade Jl., vol. 50, no. 52, Dec. 24, 1919, pp. 1483-1484, 1 fig. Plant has storage capacity of 100,000 tons.

Equipment for Handling Coal and Ashes in Power Plants, Robert June. Elec. Rev. (Chicago), vol. 76, no. 3, Jan. 17, 1920, pp. 109-110, 2 figs. Operating features of continuous belt, hoist, skip hoist and telpherage apparatus.

Improved Coal-Handling Facilities at Cos Cob. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 143-146, 8 figs. Concerning remodeling of coal-handling and storage facilities, which gave addition of 2000 tons capacity to power-house storage bunkers.

See also Old Hickory Plant.

Portable Bucket Elevator. A New Electrically Driven Device for Unloading and Piling Coal and Other Bulk Materials (Ueber eine neuartige elektrisch betriebene Entlade- und Stapelvorrichtung für Kohlen und andere Schüttgüter), Hubert Hermanns. Elektrotechnische Zeitschrift, vol. 41, no. 3, Jan. 15, 1920, pp. 55-56, 4 figs. Portable bucket elevator.

Pumping Installation. Pumping Coal, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 13, March 25, 1920, pp. 405-406, 1 fig. Installation at Hammersmith Power Station, England. Coal is discharged into large overhead steel copper which is covered with grating having mesh of five inches. Coal passes from copper through weighing device into tank, where it is mixed with water. From tank it is sucked into inlet of 7-in. Gwynne motor-driven centrifugal sludge pump, delivery pipe of which is connected with 8-in. main pipe line 1,750 ft. long. Pipe line has branches and by ordinary sluice valves stream of coal and water can be directed into any one of delivery tanks.

Retarding Conveyors. Lowering Lump Coal Down a Steep Mountain on a Moving Bed of Slack, Donald J. Baker. Coal Age, vol. 18, no. 2, July 8, 1920, pp. 53-58, 10 figs. Describes what are probably two longest retarding conveyors in the world, at Beard's Fork mine in Fayette County, W. Va.; machines require power to start them, but one, when started, is self-actuating and other approaches that point; save coal from breakage and act as picking tables.

Suction Method. Coal-Handling by Suction. Iron and Coal Trades Rev., vol. 100, no. 2707, Jan. 16, 1920, p. 85, 3 figs. Plant discharges at rate of 20 tons per hour and it is said to handle class of coal from finest slack up to nuts.

Telpher System. British Coal Handling Equipment Contrasted. H. Hubert. Coal Trade Jl., vol. 51, no. 8, Feb. 25, 1920, pp. 215-216, 2 figs. Mono-rail telpherage system is said to be in favor at public utility plants in England.

Trucks vs. Conveyors. Application of Trucks for Storing Coal. Coal Trade Jl., vol. 51, no. 1, Jan. 7, 1920, pp. 26-27, 4 figs. Experience of coal company in substituting trucks for conveying machinery.

[See also ASH HANDLING; COKE HANDLING, Gas-Works Equipment; LIGNITE, Conveying Equipment; STEAM-POWER PLANTS, Auxiliary Apparatus.]

COAL INDUSTRY

Bureau of Mines. What the Bureau of Mines Purposes to Do on Behalf of the Coal Industry, F. G. Cottrell. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 731-735, 1 fig. Has only $50 a mine and 65 cents per miner to expend on coal industry. Would coöperate with industry in running test mines so as to save coal and labor and to settle wage controversies. Paper read before Rocky Mountain Coal Min. Inst.

Coal Prices. Costs Constitute the Only Fair Basis for Fixing Prices, Frank Wilbur Main. Coal Age, vol. 17, no. 22, May 27, 1920, pp. 1095-1096. In figuring costs, it is held, allowance should be made for reasonable wages for proprietors and equitable interest on capital invested. Standardized fundamental methods of cost accounting are advocated.

Labor Held Blameless for Price Increases. Coal Age, vol. 17, no. 22, May 27, 1920, pp. 1089-1091. It is held that increased wages to labor "are in no way responsible for increased prices" of coal. Fundamental cost of high prices is held to be profiteering by producers, middlemen and retailers. Statement by Railroad Brotherhoods in hearings before U. S. Railroad Labor Board.

Europe. Notes on the Coal Industry of Northeastern France, Belgium, the Saar, and Westphalia, 1904-1913, H. E. Crooks. Economic Geology, vol. 15, no. 4, June 1920, pp. 277-311, 6 figs. Summary of data embodied in report to American Commission to Negotiate Peace, War Damages Board, Section of Mines and Metallurgy, Paris.

France. The Mineral Industries of France, Maurice Altmayer. Eng. & Min. Jl., vol. 109, no. 1, Jan. 3, 1920, pp. 12-16. Country is represented as facing serious shortage of coal despite restitutions mentioned in peace treaty with Germany. Importance of expeditious development of reciprocally advantageous commercial intercourse is pointed out.

Germany. The German Coal, Iron and Steel Industries. Iron and Coal Trades Review, vol. 100, no. 2711, Feb. 13, 1920, pp. 214. It is stated that total production of coal throughout country in 1919 was 116,500,000 tons as compared with 160,500,000 tons in previous year, and of lignite, 93,800,000 tons and 100,600,000 respectively.

See also STEEL INDUSTRY, Germany, 1918-1919.

New Zealand. Report on Nationalization of the New Zealand Coal Industry. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 135-137. New Zealand Board of Trade recommends system of national control rather than national purchase and direct State management of coal mines.

Problems. Present Problems of Mining Industry, Van H. Manning. Min. & Sci. Press, vol. 119, no. 23, Dec. 6, 1919, pp. 816-818. Such as frequent periods in which the bituminous mines, especially in spring and summer months, are not worked from causes not under the control of either operator or miner. Address delivered before Am. Min. Congress.

Production in U. S. Reports on Activities in Coal-Mining Fields. Coal Age, vol. 17, no. 3, Jan. 15, 1920, pp. 119-135, 6 figs. Statistics of coal production by States, based on reports of mining inspectors.

Profits and Prices in England. Profits and Prices in the Coal Mining Industry. Colliery Guardian, vol. 119, no. 3085, Feb. 13, 1920, pp. 450-452. Report by Alfred Tongue & Co., chartered accountants, Manchester and Glasgow, on investigation into finances of coal mining industry. Summary of estimated deficiency for year from July 16, 1919, and analysis of exports.

Seasonal Freight Rates. Seasonal Freight Rates Will Affect Coal Fields in Varying Degrees, F. G. Tryon. Coal Age, vol. 17, no. 21, May 20, 1920, pp. 1033-1037, 4 figs. Diagrams comparing seasonal rates with production in various regions of United States and with average spot prices. From testimony presented by Director of Geological Survey at hearings on seasonal coal freight rate bill.

Stabilization. Stabilization of Coal Industry Depends on Improvement in the Railroad Situation, Howard N. Eavenson. Min. & Metallurgy, no. 162, June 1920, pp. 5-6. Experience of United States Coal & Coke Co. is quoted as illustrating present conditions. It is stated that although that company has capacity of 20,000 tons daily, only 12,000 tons on average can be produced owing to car shortage.

The Bituminous Coal Industry and the Necessity for Stabilizing Same, Eugene AcAuliffe. Jl. Engrs. Club of St. Louis, vol. 5, no. 1, Jan., Feb., March 1920, pp. 4-26. Remedies suggested to stabilize industry are publication of seasonal coal freight rates with reduction below established basis during months March to August, and proper storing of bituminous coals during summer months.

COAL METERS

Lea. The Lea Coal Meter, J. H. Blakey. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1060-1061, 4 figs. Illustrating application of meter to Babcock & Wilcox boiler and also to boiler fed intermittently.

COAL MINES

Accidents. The Levant Mine Disaster. Iron & Coal Trades Rev., vol. 100, no. 2715, March 12, 1920, pp. 346-347, 2 figs. Circumstances attending breaking of man engine which occurred at Levant Mine, Cornwall, on October 20, 1919. Method of raising and lowering men at mine has been abandoned, and system has been introduced which permits ingress and egress to mine by means of ladders in main-engine shaft, pending sinking and equipment of vertical winding shaft.

Barrier Pillars. Property Owners Try to Control a City Mine Fire by Strip Pit and Clay Bank, Donald J. Baker. Coal Age, vol. 17, no. 21, May 20, 1920, pp. 1043-1045, 7 figs. Fire in mine at Squirrel Hill district of Pittsburgh.

What Barrier Coal Has Been and Should Be Left to Protect Anthracite Mines, W. B. Richards. Coal Age, vol. 17, nos. 22 and 23, May 27 and June 3, 1920, pp. 1097-1101, 7 figs., and 1135-1140, 10 figs. May 27: Records several cases where barrier pillars were provided, what rock overburden and water pressure they sustained, their thickness, height and character and their ability to satisfactorily function. Some experience is given

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as to longitudinal draw. June 3: Survey of formulæ and methods that have been developed for determining size of barrier pillars.

British Regulations. The New General Regulations. Colliery Guardian, vol. 120, no. 3110, Aug. 6, 1920, pp. 375-376. Also Iron & Coal Trades Rev., vol. 101, no. 2736, Aug. 6, 1920, pp. 168-170. Precautions against coal dust and against spontaneous combustion of coal. Regulations in regard to rescue apparatus, and code of rules for conduct and guidance of persons employed in rescue work.

Cable Installation. The Installation of a Shaft-Cable at Kirkby Colliery, Joseph Bircumshaw. Trans. Instn. Min. Engrs., vol. 59, part 2, May 1920, pp. 109-113, 9 figs. on supp. plate. Method of supporting cable through brickwork walling and through cast-iron tubing illustrated.

Canadian, Firedamp in. Firedamp in British Columbia, James Ashworth. Can. Min. Inst. Bull., no. 94, Feb. 1920, pp. 124-146, 10 figs. Gives instances of firedamp explosions at Canadian mines and results of analyses, together with writer's views, on causes for outbursts of gas and coal at mines.

Collieries. Granby Consolidated Company's Colliery, B. C. Cassidy, R. R. Wilson. Coal Age, vol. 17, no. 7, Feb. 12, 1920, pp. 300-304, 12 figs. Colliery was developed to furnish coal to by-product coke colliery. Attention is called to features of plant installed to provide for comfort of workers.

No. 1 Plant of the Mather Collieries, Donald J. Baker. Coal Age, vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 783-786, 11 figs. Plant was designed for capacity of 5000 tons in 8 hr.

Dewatering. Eliminating Mine Pumps, L. A. Riggs. Coal Age, vol. 6, no. 23, Dec. 25, 1919, pp. 926-929, 7 figs. Dewatering mine by construction of jack run drainage ditch.

Doors. Mine Door Set Automatically into Action by Weight of Trip. Coal Age, vol. 18, no. 4, July 22, 1920, pp. 169-170, 3 figs. Weight of moving trip upon track approach causes doors to open. After trip has passed, doors close under action of counterweight.

Dorr Hydroseparator. Slush Breaker and Mine-Water Problems, John Griffin. Coal Age, vol. 17, no. 8, Feb. 19, 1920, pp. 349-353. Plant equipped with Dorr hydroseparator and three Dorr duplex classifiers.

Economic Layout. Planning a Mine So as to Secure Maximum Recovery, W. B. Riggeleman and Evan L. Griffiths. Coal Age, vol. 17, no. 9, Feb. 26, 1920, pp. 389-391, 2 figs. Comparative study of various methods of operating coal mines, with diagram illustrating amount of coal removed by each method.

Electrically Operated Labor-Saving Devices. New Shaft Operation of the Jamison Coal & Coke Co. at Pleasant Unity, Donald J. Baker. Coal Age, vol. 17, no. 5, Jan. 29, 1920, pp. 212-215, 12 figs. Attention is called to installation of electrically-operated devices for saving of labor.

Electricity Supply. Supplying Electricity to Coal Mines. Elec. World, vol. 74, no. 22, Dec. 27, 1919, pp. 1154-1157, 8 figs. Standardization of lines and sub-stations and diversity of loads quoted as outstanding features of Indiana installation.

Electrification of. The Electrification of the Works and Collieries of the Ebbw Vale Steel, Iron and Coal Company, Limited, Walter Dixon. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 3, 11 pp., 5 figs. Principal Power Station is equipped with four turbo alternators, two of 2000 kw. and two of 5000 kw. Alternating current is generated at 2000 to 2200 volts, three-phase, with periodicity of 50, and turbines are arranged for steam pressure of 175 lb. with superheat.

Exhaust-Steam Utilization in. Cutting Power Costs at an Anthracite Mine by Utilizing Exhaust Steam, Dever C. Ashmead. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 983-986, 7 figs. Experience of Price-Pancoast Coal Co., Scranton, Pennsylvania, with low-pressure turbines utilizing exhaust steam from several engines.

Explosions. Report of Some of the Most Interesting Explosions in Prussian Anthracite Mines During 1918 (Mitteilungen über einige der bemerkenswertesten Explosionen beim preussischen Steinkohlen bergbau im Jahre 1918). Zeitschrift für das Berg- Hütten-u. Salinenwesen im preusischen Staate, vol. 67, no. 2, 1919, pp. 100-131, 18 figs. Report on causes and damages resulting from ten different explosions, based on official figures.

Tests Made with Rock Dust for Fighting Explosions in Mines (Versuche mit Gesteinstaub zur Bekämpfung von Grubenexplosionen, ausgeführt in der Versuchsstrecke der Knappschafts-Berufsgenossenschaft in Derne), C. Beyling. Glückauf, vol. 55, nos. 21, 22 and 23, May 24 and 31, June 7, 1919, pp. 373-379, 398-405 and 417-422, 14 figs. Description of boxes and other containers for holding dust. Also no. 25, June 21, 1919, pp. 457-466. Describes two different ways of applying rock dust to prevent and limit explosions.

Two Deaths from Blackdamp, Donald J. Baker. Coal Age, vol. 16, no. 22, Dec. 11 and 18, 1919, pp. 885-886, 2 figs. Accident related as emphasizing importance of carrying safety lamps when entering old or abandoned workings.

See also EXPLOSIONS, Coal Mines.

Fans, Parallel Running of. Running Two Fans in Parallel at Bentley Colliery, R. Clive. Colliery Guardian, vol. 119, no. 3091, Mar. 26, 1920, pp. 869-870 and (discussion) pp. 870-871, 2 figs. Tests were made on two fans of 300,000 and 350,000 cu. ft. per min., respectively, to compare mechanical efficiency of running them singly and in parallel. When running fans in parallel higher average over-all efficiency was obtained. Paper read before Midland Institute of Min., Civ. & Mech. Engrs.

Ferric Hydrate from Mine Water. Six Tons of Ferric Hydrate Secured Daily from Water at a Connellsville Mine, L. D. Tracy. Coal Age, vol. 18, no. 1, July 1, 1920, pp. 13-16, 2 figs. By treating mine water with finely ground lime, ferric hydrate is said to be obtained which is used in desulphurization of gas and as a pigment for paint. Purified water is used for quenching coke.

Fire Prevention. Fire Prevention in Anthracite Coal Mines, M. W. Price. Coal Age, vol. 16, no. 16, Oct. 1919, pp. 651-652. Necessary equipment for extinguishment of mine fires. Paper read before National Safety Congress.

How Gob Fires are Fought and Prevented in Pictou County, Nova Scotia, F. E. Notebaert. Coal Age, vol. 18, no. 4, July 22, 1920, pp. 161-165, 3 figs. Crushed pillars in thick seams cause many gob fires. Should smoke be seen, no time is lost in sealing up and in reopening, care is taken to keep air from the heated area or progress would be rapid from gob-stink to gob-smoke and thence to gob-fire.

Illinois Mines Guard Their Timbered Shaft Bottoms by Fusible-Plug Sprinklers, Donald J. Baker. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 719-722, 8 figs. State statutes demand elimination of fire hazards below ground. To secure this protection one operator uses fusible fireplug sprinkler heads on pressure lines containing rain water only.

Firedamp. Effects of Earth Pressure in Coal Mining (Quelques effects de pressions de terrains dans les exploitations houillères), L. Morin. Bulletin et comptes rendus mensuels de la Société de l'Industrie minérale, vol. 17, no. 3, May-June 1920, pp. 229-274, 2 figs. Sudden disengagements of firedamp are explained as resulting from mechanical actions on coal produced by great pressures it has borne in terrestrial movements, as also from pressures to which it might have been subjected in recent times. It is, therefore, concluded that study of instantaneous vibrations of firedamp should be linked with examination of pressures that have existed in region. Points to consider in coal mining for preventing sudden escape of firedamp are also formulated.

Firedamp Detectors. Gas Detectors for Miners' Electric Lamps, T. J. Thomas. Colliery Guardian, vol. 118, no. 3057, Aug. 1, 1919, pp. 295-296. Instruments depending upon combustion of fire damp as distinguished from catalytic action with platinum, especially the méthanometre automatique of Prof. Monnier.

The Fleissner Singing-Flame Lamp, William Maurice. Colliery Gaurdian, vol. 119, no. 3102, June 11, 1920, pp. 1643-1644, 4 figs. Free and condensed translation, with sundry interpolations, of two papers by Dr. Hans Fleissner, published in Austrian mining journal, Bergbau u. Hütte, Aug. 1916, and April 1917, describing his new firedamp detector in which advantage is taken first of means of methane detection by phenomenon of explosive limit, that is, by observation of "cap" or "halo," and secondly, by sound; device has its origin in phenomenon of chemical harmonica or singing flame, resulting when a vertical tube, open at both ends, within which a flame is burning, produces a powerful resonance of tube.

Fires. Does Fusain Cause Mine and Bin Fires, Spoil Coke and Aid Explosions? F. S. Sinnatt, H. Stern and F. Bayley. Coal Age, vol. 18, no. 8, Aug. 19, 1920, pp. 384-388. Reprint of booklet entitled "Coal Dust and Fusain," published as Bulletin No. 5 by Lancashire and Cheshire Coal Research Assn., College of Technology, Manchester, England.

Fires, Location of. Possibilities of the Geophone in Locating Mine Fire Areas, L. D. Tracy and Allan Leighton. Coal Age, vol. 17, no. 2, Jan. 8, 1920, pp. 40-42, 3 figs. Instrument is similar to physician's stethoscope. Advantage claimed over other listening devices is absence of electric battery.

France, Destruction of. Destruction of French Coal Mines and Plants and Their Rehabilitation, George S. Rice. Jl. Franklin Inst., vol. 189, no. 6, June 1920, pp. 737-778, 21 figs.

Systematic Destruction by the Germans of the Collieries in the North of France (Les destructions systématiques comises par les Allemands dans les houillères du nord de la France), M. Gruner. Génie Civil, vol. 76, no. 5, Jan. 31, 1920, pp. 113-118, 19 figs. Presidential address delivered before Société des Ingénieurs Civils.

Gases in. Hydrocarbon Gases Found in British Columbia Mines, James Ashworth. Coal Age, vol. 17, no. 13, March 25, 1920, pp. 587-589. Facts are quoted relating to outflow of gas into mine as influenced by periods of idleness and periods when mine was working normally. These facts were determined by results obtained by analysis of mine air taken at different times and analyzed in laboratory under direction of Minister of Mines, as tabulated in his Annual Report for the year 1918.

Haulage Inclines. Accidents on Haulage Inclines, V. Watteyne and L. Lebens. Colliery Guardian, vol. 118, no. 3074, Nov. 28, 1919, pp. 1431-1432, 7 figs. Precautions to observe in installation of pulleys and brakes.

Haulage Signals. Alternating-Current Haulage Signals, A. Lees. Iron & Coal Trades Rev., vol. 100, no. 2720, April 16, 1920, pp. 518-519, 13 figs. Alternating-current signaling is claimed to be more reliable than operation of signals by primary batteries. Comparative study of various kinds of alternating-current signaling is made.

Humidification in. Humidification of Coal Mine Atmosphere, Joseph J. Walsh. Coal Industry, vol. 3, no. 9, Sept. 1920, pp. 451-452, 1 fig. Construction and operation of Kelly spraying head.

Illinois and Indiana. Engineering Features of Modern Mines, C. A. Herbert and C. M. Young. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 514-521, 8 figs. Describing features with reference to modern coal mines of Indiana and Illinois. Giving surface and bottom layouts, systems of mining, ventilation and haulage and plans for safety.

Inspection. Advances in Utah Coal Mine Inspection, C. A. Allen. Coal Ind., vol. 3, no. 10, Oct. 1920, pp. 484-485. Facts concerning mine inspection department. Abstract of paper before Rocky Mountain Coal Min. Inst.

Joint Operation. Lucerne Mines, Shaft and Two Drifts Make Current for Thirty-Two Plants, Ralph W. Mayer. Coal Age, vol. 18, no. 10, Sept. 2, 1920, pp. 481-484, 9 figs. Three practically distinct mines are joined underground and have common tipple. Bone from four picking tables, 28 per cent ash, is used as fuel at central power plant.

Lighting. At Gary Working Faces are Alluminated by a Permanent Lighting System. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 736-738, 3 figs. Practice of United States Coal & Coke Co. Two or three electric bulbs are kept within ten feet of every working face throughout its operations.

Management Methods. Management Methods That Will Secure Results in Mine Construction, Charles Gottschalk. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 987-989. Organization required for simultaneously carrying on various operations involved in constructing surface layout and in developing underground nucleus for coal mine of large capacity.

Mather, W. Pa. Mather Mine in the Greene County Field, J. O. Durkee. Coal Industry, vol. 3, no. 5, May 1920, pp. 216-222, 10 figs. Description of plant said to be one of most efficiently equipped in Western Pennsylvania, in which concentrated panel system of mining has been adopted, distance between face entries being 1200 ft. Notes on shafts, power supply, hoisting machines, welfare and community work, etc.

Mechanical Equipment. Nemacolin Mine of the Buckeye Coal Co., J. O. Durkee. Coal Industry, vol. 3, no. 3, Mar. 1920, pp. 128-133, figs. Details of power house, tipple, coal- and rock-storage bins and hoisting room.

Mine Rescue Apparatus. See Rescue Apparatus.

Pennsylvania. Burnside Colliery of the Reading Company at Shamokin, Pa. Coal Age, vol. 17, no. 8, Feb. 19, 1920, pp. 340-346, 10 figs. Attention is called to details of concrete supporting structures and to concrete rooms built at shaft stations for accommodation of men waiting to go to surface.

Reinforced Concrete, Use in. The Applications of Ferro-Concrete in Mines, T. J. Guéritte. Trans. Instn. Min. Engrs., vol. 58, part 3, Feb. 1920, pp. 184-205 and (discussion) pp. 205-211, 23 figs. Writer discusses application of ferro-concrete to colliery work, both above

ground and underground, citing various examples.

Rescue Apparatus. Effective Means of Using Rescue Apparatus in the Fighting of Mine Fires, J. T. Ryan. Coal Age, vol. 16, no. 19, Nov. 6, 1919, pp. 741-743. Organization and equipment of rescue crews. Paper read before Min. Section of National Safety Congress.

See also BREATHING APPARATUS.

Rescue Apparatus Rules. See British Regulations.

Rescue Training. Desirability of Standardizing Mine Rescue Training and a Plan Therefor, D. J. Parker. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 686-687. Principally because "thorough and systematic training are essential to insure safe and economic use of apparatus", and "such training can best be secured through standardization of training methods."

Rescue Work. See MINE RESCUE APPARATUS; MINE-RESCUE WORK.

Safety in. Dangerous and Safe Practices in Bituminous Coal Mines, Edward Steidle. Dept. Interior, Bur. Mines, miners' circular 22, 1919, 110 pp., 181 figs. Based on reports of State mine departments.

Safety Lamps. See SAFETY LAMPS.

Signal Indicators. The Deanal Visual and Aural Indicator. Iron & Coal Trades Rev., vol. 101, no. 2737, Aug. 13, 1920, pp. 193-194, 5 figs. Apparatus in use at Birchenwood Colliery, Kidsgrove, Stoke-on-Trent, England. Essential feature is operation by action of falling metallic balls which in descending actuate through a lever the finger of an indicating dial.

Visual and Audible Signal Indicator at Blairhall Colliery. Colliery Guardian, vol. 118, no. 3070, Oct. 31, 1919, p. 1163, 5 figs. Instrument is of aluminous type and comprises polished wood case hinged in two parts and so made as to be placed on floor immediately in front of engine keeper when operating engines.

Small Mines. Little Mines Make Big Profits for Owners, Donald J. Baker. Coal Age, vol. 18, no. 16, Oct. 14, 1920, pp. 799-800, 4 figs. Royalties amounting to as much as $5000 per acre are being paid to farmers on small coal acreages on outskirts at Pittsburgh.

Stone Dusting. See COAL, Volatile Matter, Neutralizing.

Surface Subsidence. The Movements Accompanying Surface Subsidence, K. Lehmann. Colliery Guardian, vol. 119, no. 3089, March 12, 1920, p. 734, 4 figs. Method of calculating compression and disruption in subsidence is illustrated. Translated from Glückauf.

Swanwick. New Pit at Swanwick Collieries. Iron & Coal Trades Rev., vol. 99, no. 2697, Nov. 7, 1919, pp. 593-594, 8 figs., partly on supp. plate. Concerning coal pit which is 16 ft. in diameter and has been sunk to depth of 400 yd.

Ventilation. A Portable Direct-Reading Anemometer for the Measurement of Ventilation of Coal Mines, J. T. MacGregor-Morris. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 279-280, 4 figs. Paper read before Eng. Section, British Assn. for Advancement of Science.

Efficient, Practical Ventilation for Mines. Coal Industry, vol. 3, no. 10, Oct. 1920, pp. 480-482. Notes on relation to kind and size of airways, constant power, continuous current, splitting and regulators, stoppings and their construction, and installation of fans with practical features. Report of Coal Mine Inspection Force of Colo. before Rocky Mountain Coal Min. Inst.

Force and Exhaust Systems of Ventilation, R. Z. Virgin. Coal Industry, vol. 3, no. 6, June 1920, pp. 278-280, 1 fig. Features of each, showing advantages and disadvantages. Reference is made to discrepancies in laws of different states.

Recent Progress in Mine Ventilation, Ray W. Arms. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 2-5. States that multiple entries, auxiliary shafts, electrically operated fans and fireproofing ventilating equipment have been introduced in consequence of their having demonstrated their efficiency in testing laboratories.

Running Two Fans in Parallel at Bentley Colliery, and other Ventilating Problems, R. Clive. Trans. Instn. Min. Engrs., vol. 59, part 2, May 1920, pp. 135-144 and (discussion) pp. 144-152, 1 fig. Data on comparative mechanical efficiency of running fans singly or in parallel.

Ventilating an Extensive Thin-Coal Mine, Donald J. Baker. Coal Age, vol. 18, no. 3, July 15, 1920, pp. 103-105, 5 figs. Air is forced into one end of mine and sucked out at the other. Rope drive between exhaust fan and actuating motors forms medium of power transmission. Fan shaft provides means for a second mine exit and for boosting voltage.

See also Fans, Parallel Running of.

Water Testing at. Colliery Water Testing with the Dionic Apparatus. Colliery Guardian, vol. 120, no. 3115, Sept. 10, 1920, pp. 730-731, 3 figs. Working principle of apparatus is based upon fact established by Kohlrausch that conductivity of pure water containing any electrolytic substance in solution is due almost entirely to dissolved substance, and only to a negligible extent to the water itself.

Welfare Work. See WELFARE WORK, Coal Mine.

COAL MINING

Beds Separated by Stratum. Successful Methods of Working Two Coal Beds Separated by Six Feet of Slate, Dever C. Ashmead. Coal Age, vol. 17, no. 24, June 10, 1920, pp. 1189-1190, 9 figs. After mining lower bed, upper one was dropped and coal loaded out.

Blow-Out Shots Detecting. An Analytical Method for Detecting Blow-Out Shots in Coal Mines, G. F. Hutchinson and Jacob Barab. Dept. Interior, Bur. Mines, Technical Paper 210, 1919, 22 pp. Method devised at explosives chemical laboratory of Bur. of Mines for analyzing solid products of explosions.

Borehole Drilling. Drilling Boreholes Through 136 Ft. of Coal Against Head of Water, D. C. Ashmead. Coal Age, vol. 18, no. 8, Aug. 19, 1920, p. 390, 1 fig. To tap two barrier pillars a core drill was used making 3⅝-in. hole. Pressure of water is said to have been kept under complete control.

Caterpillar Tractor Haulage. Caterpillar Tractor Supplants Team at Pennsylvania Coal Mine. Coal Age, vol. 18, no. 13, Sept. 23, 1920, pp. 629-630. Device gathers mine timbers, hauls rails and props, pulls railroad cars and performs in general work of mine team at Clarion County (Pennsylvania) mine.

Coal-Cutting Equipment. Approved Explosion-Proof Coal-Cutting Equipment, L. C. Ilsey and E. J. Gleim. Dept. Interior, Bur. Mines, bulletin 78, 1920, 53 pp., 35 figs. Gives Bureau's schedule and shows its application to testing of commercial apparatus. Describes electrical apparatus that has been tested and approved under this schedule and also tests on which approvals were based.

Coal-Cutting by Electricity and Timbering at Cannock Chase Colliery, W. P. Cheung. Trans. North of England Inst. Min. & Mech. Engrs.,

vol. 69, part 3, June 1919, pp. 29-32. Longwall method of working is used, machine-face has straight face of from 60 yd. to 120 yd. and holing is "end on."

Economy and Safety are Secured by Use of Alternating-Current Coal Cutters, Charles B. Officer. Coal Age, vol. 17, no. 26, June 24, 1920, pp. 1303-1306, 4 figs. Savings in equipment cost, in power expense and maintenance charges, as well as greater safety are said to accrue from use of alternating instead of direct-current for driving undercutters.

Electrically Operated Excavating Machinery in French Mines (Sur l'avenir des installations d'extraction à commande électrique dans les mines françaises), A. Barjon. Revue générale de l'Electricité, vol. 6, no. 22, Nov. 29, 1919, pp. 768-773, 6 figs. Comparative study of machinery used in collieries. Operation of Leonard coupling with Koepe pulley is particularly noted and advantages of systems are exposed.

See also Thin-Seam, Machine.

Culm Banks. Removing Boiler Ash, Burned Coal and Slate from the Coal in a Culm Bank, Dever C. Ashmead. Coal Age, vol. 18, no. 16, Oct. 14, 1920, pp. 796-798, 3 figs. Problems involved in preparation of anthracite from culm banks.

Dual Shafts. Layout for Dual Shafts of Large Tonnage, Robert Z. Virgin. Coal Age, vol. 18, no. 8, Aug. 19, 1920, pp. 388-389, 1 fig. Suggested design for landing of twin shafts, both of which are to deliver coal.

Electricity in. A War-Time Plant in the Pittsburgh Field, Donald J. Baker. Coal Age, vol. 17, no. 12, Mar. 18, 1920, pp. 527-531, 11 figs. Description of colliery operated mostly by electricity.

Electricity Applied to Coal Mining, C. B. Reed. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 510-513. Also in Popular Engr., vol. 12, no. 6, Dec. 1919, pp. 10-13. Discussion of development of mining machines to present types designed according to conditions in different seams. Reference is made to electric haulages, crushers and equipment.

Electricity in Pierce County Coal Mines, E. J. Barry. Jl. Electricity, vol. 44, no. 11, June 1, 1920, pp. 565-567, 2 figs. Experience of company in Washington State.

Electric Service in Illinois Coal Mine, H. W. Eales. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 676-678, 5 figs. Installation of Union Colliery Co. at Dowell, where energy consumption is said to be about 4 kw-hr. per ton of coal mined.

Using Electric Power for Mining Coal. Black Diamond, vol. 64, no. 17, April 24, 1920, pp. 462-465, 7 figs. Details of Kentucky and West Virginia Power Company's plant which supplies power to practically all of coal mines in Logan district and to most of those in Mingo County, West Virginia and Pike and Perry Counties, Kentucky.

Explosives. See EXPLOSIVES, Safety Devices.

France. Mining of the Great Coal Deposits at Saint-Éloy-Les-Mines, Puy-de-Dôme (L'exploitation des grandes couches), Louis Martin. Bulletin et comptes rendus mensuels de la Société de l'Industrie Minerale, vol. 16, no. 4, 1919, pp. 261-289, 14 figs. There are two coal layers, one 8 m. to 10 m. and the other 15 m. to 20 m. in thickness, separated by carbonaceous schist 0 m. to 10 m. thick.

Study of the Technical Means Which May Be Applied to Increase Production of French Collieries (Enquête sur les moyens techniques susceptibles d'augmenter la production des houillères Françaises). Bulletin et Comptes rendus mensuels de la Société de l'Industrie minérale, vol. 17, no. 5, Jan.-Feb. 1920, pp. 83-103, 14 figs. Report of committee appointed to study mining methods in use at collieries of Decazeville. Suggestions are made, such as using pneumatic hammer, and employing hydraulic fill wherever fire is feared, etc.

German Regulations. State Participation in German Coal Mining, E. Jüngst. Colliery Guardian, vol. 118, no. 3071 and 3072, Nov. 7 and 14, 1919, pp. 1230-1231 and 1297-1298, 3 figs. Tables showing records of yearly mining operations in various districts from 1880 to time of war. Statistics of recovery of by-products in various districts. Translated from "Glückauf."

Haulage. Engineering Feature at Modern Mine, J. O. Durkee. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 11-14, 4 figs. Principal features are said to be unusual incline plane on which switches are eliminated, drift for plane machine and seam tunnel through which coal from another seam is being hauled.

See also MINE HAULAGE, Factors Influencing.

Haulage Cars. Solid Cars at Strip Pit Combine Stability, Strength and "Dumpability," D. J. Baker. Coal Age, vol. 18, no. 13, Sept. 23, 1920, pp. 623-628, 11 figs. Solid-body dump cars used for haulage.

Hoisting. A Modern Coal Hoisting Installation, Graham Bright. Coal Industry, vol. 3, no. 5, May 1920, pp. 223-226, 8 figs. Description of a slope hoist with different conditions to meet than shaft hoists. Notes on operation of hoisting and difficulties to overcome with slope hoists, stating thirteen safety features. Abstract of paper presented before Pittsburgh section meeting, Am. Inst. E. E.

Hoisting Equipment. See MINE HOISTING, Coal Mines.

Hydraulic Stowing. Hydraulicking Earth, C. A. John Hendry. Eng. & Contracting, vol. 52, no. 27, Dec. 31, 1919, pp. 748-750, 5 figs. Conditions prevailing at various mines in India where stowing is practiced. From paper read before Geological & Min. Soc.

Primary Considerations in Hydraulic Stowing, John Hendry. Coal Age, vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 787-792, 14 figs. Also in Can. Min. Jl., vol. 41, no. 3, Jan. 23, 1920, pp. 56-60, 14 figs. Suggestions in regard to preliminary investigations to conduct before introducing hydraulic stowing in mine. Paper read before Geological & Min. Soc. of India.

The Suggested Application of Hydraulic Stowing to Undersea Coal Workings with Special Reference to the Sydney Coal Field, Walter Herd. Can. Min. Jl., vol. 41, no. 20, May 21, 1920, pp. 412-415, 5 figs. Writer suggests that some form of hydraulic stowing be adopted in remaining seams to be worked under sea down to 800 ft. of cover. Paper read before Min. Soc. of Nova Scotia.

Labor-Saving Machinery. Improving the American Coal Situation, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1100-1102, 1 fig. Possible ways to increase the coal production by the introduction of labor-saving machinery, and use of coal at mines.

Loading Machines. Loading Machines for Underground Use, A. M. Gow. Eng. & Min. Jl., vol. 109, no. 5, Jan. 31, 1920, pp. 319-337, 47 figs. Their efficiency in reducing mucking charges is pointed out. Survey of types in use indicates preference for compressed air as motive power in underground mechanical loading.

Longwall System. Longwall Mining and Coal

Conservation, J. H. Cunningham. Can. Min. Inst. Bul., no. 98, June 1920, pp. 485-495. Points out considerations which should govern use of "longwall" system of mining and emphasizes effect of its use on conservation of coal resources of country.

Management in. See INDUSTRIAL MANAGEMENT, Coal Mining.

Miners' Lamps. See MINERS' LAMPS.

Miners' Nystagmus. The Economic Aspect of Miners' Nystagmus, T. Lister Llewellyn. Colliery Guardian, vol. 119, no. 3101, June 4, 1920, pp. 1565-1567, 5 figs. It is claimed that nystagmus is due to deficiency light in coal mines, and improvement of illumination underground is urged as preventative.

Mining Laws. See MINING LAWS.

Open-Pit, Lignite. Open Pit Mining of Brown Coal, Germany, Hubert Hermans. Coal Industry, vol. 3, no. 9, Sept. 1920, pp. 424-427, 5 figs. Mechanical equipment used, notably steam shovel used in stripping operations for removing overburden and digging machine having housing built like portal in which cars are loaded.

Panel System. Panel System of Coal Mining, A Graphical Study of Percentage of Extraction, C. M. Young. University of Ill. Bul., vol. 16, no. 39, May 26, 1919, 74 pp., 20 figs. Investigation is said to show that highest extraction which can possibly be attained under conditions assumed, with rooms 300 ft. long and 30 ft. wide on 50-ft. centers, is only 57.05 per cent. Advantages of greater extraction are pointed out.

Pennsylvania. Working Both Freeport Beds Together, Donald J. Baker. Coal Age, vol. 17, no. 15, Apr. 8, 1920, pp. 691-697, 11 figs. Mining of coal beds in Alleghany County, Pa.

Pillar Drawing. Different Methods of Pillar Drawing, A. W. Hesse. Coal Indus., vol. 2, no. 12, Dec. 1919, pp. 543-551, 7 figs.; also Coal Age, vol. 16, no. 21, Nov. 27 and Dec. 4, 1919, pp. 845-849, 7 figs. Fairmount, Keighley, Gay and Block systems; half advance and half retreat, concentrated and two other methods. Factors which affect pillar drawing.

Pneumatic Picks. The Eloy Pneumatic Pick. Colliery Guardian, vol. 120, no. 3111, Aug. 13, 1920, pp. 450-452, 7 figs. Pick made by Messrs. Reavell and Co., Ipswich, England.

The Use of Pneumatic Picks in Coal Mining (L'emploi de marteaux a air comprimé pour l'abatage de la houille), M. A. Dessemond. Bul. et Comptes rendus mensuels de la Société de l'Industrie Minérale, vol. 17, no. 2, March-April 1920, pp. 125-143, 2 figs. Records of service at Saint-Etienne collieries, where 70 per cent of coal produced is mined with pneumatic picks.

Power Requirements. Power Requirements for Coal Mining, Robert Anthony. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 14-15, 6 figs. Energy consumption and minimum demand of bituminous coal mines shown under different mining conditions and with varying output of coal. Suggestions made for successfully changing over old mines.

Production Per Miner. Working Capacity of Coal Miners, A. Delmer. Mining Jl., vol. 20, no. 234, Nov. 15, 1919, pp. 470-472. Tables showing average production per workman in principal coal fields of the world. Translated from Annales des Mines de Belgique.

Roof Control. Roof Control in Coal Mines, James Ashworth. Can. Min. Jl., vol. 40, no. 48 and 49, Dec. 3 and 10, 1919, pp. 901-904, 933-935, 8 figs. It is concluded from analysis of conditions at various mines that "bumps" are not related to outbursts of explosive gases, but are caused by subsidence of roof under rigidity rocks.

Sealing Abandoned Workings. Sealing or Ventilating Abandoned Workings, D. Harrington. Coal Industry, vol. 3, no. 8, Aug. 1920, pp. 360-362. It is shown that sealing abandoned workings is safest and most economical method. Considerations are given affecting operations, safety, mine fires, mine explosions and nature of stoppings used.

Shaft Layout. Mine Layout Arranged for Large Tonnage and Minimum Handling Cost, James R. Elliott. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 978-979, 3 figs. Shaft layout at Mather Collieries, Greene County, Pennsylvania.

Shaft Sinking. Colliery Shaft Sinking, Edmund L. Hann. Times Eng. Supp., no. 536, June 1919, p. 188. Novel methods in Kent.

See also SHAFT SINKING.

Shaft Sinking Through Quicksand. The Chislet Colliery, Alfred S. E. Ackermann. Colliery Guardian, vol. 119, no. 3086, Feb. 20, 1920, pp. 517-519, 5 figs. Account of sinking shaft by cementation through quicksand with chalk both below and above it.

Shot Firing by Lightning. Shots Fired by Lightning Discharges, M. Ferey. Coal Age, vol. 17, no. 6, Feb. 5, 1920, pp. 272-273. Current in conductors used for firing shots in mine induced from lightning discharges during thunderstorms said to have been responsible for ignition of charges of explosives in place and connected ready for firing. Alterations of firing equipment made in order to overcome this danger are explained.

Shot Firing, Electric. Electric Shot-Firing, MM. Taffanel, Dautriche, Durr and Perrin. Colliery Guardian, vol. 118, no. 3059, Aug. 15, 1919, pp. 423-424, 7 figs. Report of investigations, particularly regarding intensity at which misfires may occur when detonators are arranged in series.

Stowing. See Hydraulic Stowing.

Strip Mining. Open Cut or Strip Mining and Its Development, H. B. Miller. Coal Age, vol. 17, no. 10, Mar. 4, 1920, pp. 434-436. It is pointed out that in selecting method of strip-pit operation, shape and size of area worked, thickness of overburden, local topography, required output, source and quality of water supply, position of roads, buildings and wooded areas above crop line, railroad approach and rights of way must all be considered.

Stripping. A Modern Coal Stripping Installation. Excavating Engr., vol. 14, no. 8, Oct. 1920, pp. 259-261, 2 figs. Description of allied Coal Co.'s installation in Ohio with special reference to operation of coal-stripping and coal-loading shovels.

By Charts of Stripping Progress and Cost Operating Losses May Be Forestalled, Thomas F. Kennedy. Coal Age, vol. 18, no. 8, Aug. 19, 1920, pp. 381-383, 5 figs. It is said that picturizing data and results makes it possible to study causes and effects and remedy leaks and losses before they become serious.

Coal Stripping in the United States, Wilbur Greely Burroughs. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 494-498, 3 figs. Thickness of coal seams and classification of overlying strata.

Estimation of Quantities Removed in the Stripping of Anthracite, Thomas F. Kennedy. Coal Age, vol. 17, no. 25, June 17, 1920, pp. 1251-1253, 1 fig. Of three methods—square, prismoidal and average-end—latter is said to be preferred.

Stripping 85-Ft. Cover from an Anthracite Bed with a Dragline Excavator. Coal Age, vol. 18, no. 2, July 8, 1920, pp. 63-66, 12 figs.

Large tonnage will be mined on surface and passed down battery breasts, which will be driven from mine below; coal is to be hauled underground to a breaker for preparation.

Where Stripping is Regarded as a Regular Adjunct to Underground Mining, Donald J. Baker. Coal Age, vol. 17, nos. 23 and 24, June 3 and 10, 1920, pp. 1143-1146, 8 figs., and 1191-1194, 5 figs. June 3: Coal is stripped by steam shovel from outcrop to contour, where depth of overburden makes open mining prohibitive. From that line, which is set where cover is 45 ft. deep, to boundary line of property underground mining methods are employed. June 10: General layout of strip pits and underground mine of Rowland-Power Consolidated Collieries Power Plant near Terre Haute, Ind.

Superimposed Beds, Working. Simultaneously Working the Superimposed Coal Beds of Virginia, Donald J. Baker. Coal Age, vol. 17, no. 11, Mar. 11, 1920, pp. 479-482, 8 figs. Output from four operations in four different beds is fed to one conveyor and prepared in one tipple.

Thin-Seam, Machine. Machine-Mining in a Thin Seam, H. O. Dixon. Trans. Instn. Min. Engrs., vol. 58, part 2, Jan. 1920, pp. 157-161 and (discussion) pp. 161-162, 4 figs. Description and illustration of a "stret"-cutting machine which averages five places cut per 7-hr. shift and yields 6 tons of coal per cut.

Training in. See EDUCATION, TECHNICAL, Coal Mining.

Utah. Coal Mining in Utah During 1919, A. C. Watts. Coal Age, vol. 17, no. 4, Jan. 22, 1920, pp. 181-184, 4 figs. It is noted that production in Utah declined, but not as much as in other states, because mines operated during strike relieving difficulties over large areas of West where strike made severe coal shortages.

Wyoming Valley. Progress and Development of Anthracite Mining in the Wyoming Valley, Edwin C. Curtis. Coal Industry, vol. 3, no. 9, Sept. 1920, pp. 448-450, 2 figs. Historical and descriptive account.

COAL PIERS

See COAL HANDLING, Coal-Loading Pier.

COAL POCKETS

Design. Coal Pockets—A Construction Opportunity, W. G. Kaiser. Concrete, vol. 17, no. 4, Oct. 1920, pp. 120-122, 5 figs. Coal pockets equipped with power-driven conveyors for unloading coal from cars into bins and with gravity chutes for transferring it from bins to wagons or trucks for delivery.

What Type of Pocket is Best Investment? Clarence C. Brinley. Coal Trade Jl., vol. 51, no. 21, May 26, 1920, pp. 575-577, 7 figs. Relation of size to tonnage, cost of operation, advantageous and disadvantageous features in particular businesses discussed.

COAL STORAGE

Bituminous Practice. Bituminous Coal Storage Practice, H. H. Stoek, C. W. Hippard, W. D. Langtry. University of Illinois Bul., Eng. Experiment Station, Bul. no. 116, 157 pp., 75 figs. Data obtained from replies received from questionnaire sent to representative individuals and companies, from investigations made by writers of fires in coal piles which have occurred in various parts of the country, and from information furnished by Fuel Conservation Section of U. S. Railroad Administration.

Storage of Bituminous Coal, 1918-19, H. H. Stoek. Coal Industry, vol. 3, no. 2, Feb. 1920, pp. 105-108. Reasons for storing coal are presented and scale of prices similar to that prevailing in anthracite field is advocated.

The Storage of Bituminous Coal, O. P. Hood. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 478-480, 8 figs. Best current storage practice. Paper read before Pennsylvania Electric Association.

Cableways for. See CABLEWAYS, Coal-Storage.

Central Stations. Effect of Coal Situation. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 772-775. Reports from 54 central stations show storage one-third normal. Prices average 176 per cent higher, economy and boiler rating are much impaired and operating difficulties are greatly increased.

Storage of Coal for Central Stations, H. H. Stoek. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 225-229, 6 figs. Discussion of question as to whether or not coal in storage deteriorates, prevention of spontaneous combustion, importance of size of coal in storage, storage of run-of-mine and slack coal, and general precautions to be taken in storing coal.

Economy and Advantages. Storage of Coal—An Engineers' Problem. Indus. Management, vol. 59, no. 5, May 1920, pp. 399-408, 3 figs. Symposium by prominent engineers. Economy of coal storage, its use for stabilizing coal industry, and its advantages to the mining industry, are discussed.

Fires. Typical Fires in Stored Coal, W. D. Langtry. Power, vol. 52, no. 14, Oct. 5, 1920, pp. 546-547, 10 figs. From records of fires compiled by U. S. Fuel Administration for Illinois.

Installations. Storing Coal in a Government Fuel Yard, T. T. Read. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 40-44. Yard was designed to store 315,000 tons of bituminous and anthracite coal per year.

Safe Methods. Safe Storage of Coal, H. H. Stoek. Monthly Reports of Investigations, Bur. of Mines, Dept. of Interior, April 1920, 8 pp. Precautions to take in storage of large and small piles.

Safe Storage of Coal, H. H. Stoek. Dept. of Interior, Bur. of Mines, technical paper 235, 1920, 10 pp. Advantages of storing coal are pointed out and methods of preventing heating of stored coal are indicated.

Timely Tips on Coal Storage, H. H. Stoek. Gas Rec., vol. 17, no. 11, June 9, 1920, pp. 31-33. Brief suggestions why and how coal should be stocked for winter demands given by U. S. Bur. of Mines. Bibliography is appended.

Storage Yards. Reading's Storage Yards Keep the Mines Running Steadily, Dever C. Ashmead. Coal Age, vol. 17, no. 13, March 25, 1920, pp. 581-586, 6 figs. Experience of Philadelphia & Reading Coal and Iron Co. is quoted as proof that coal storage results in decrease of cost of fuel to consumer by equalizing demand. Capacity of storage yard of this company is 1,000,000 tons.

Temperatures in Pile. Device That Will Show the Temperature of the Depths of a Storage Pile, R. P. Nichols. Coal Age, vol. 18, no. 10, Sept. 2, 1920, pp. 485-486, 2 figs. Thornley coalometer which shows thermal conditions throughout coal pile and gives warning when rise in temperature becomes dangerous. It consists of alcohol thermometers with long pipes terminating at end in mechanism which by expansion of alcohol operates handle on dials.

COAL TAR

Continuous Distillation. Continuous Distillation of Coal Tar (La distillation continue du goudron de houille), A. Grebel. Génie Civil, vol. 76, nos. 2 and 3, Jan. 10 and 17, 1920, pp.

41-45, 11 figs. partly on supp. plate and 68-70. Comparative study of various French and English systems of continuous distillation.

Developments in. New Developments in Coal Tar Chemicals and Specialties, Herbert G. Sidebottom. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 311-312. Survey of developments in para-coumarone resins, rubber compounding specialties, pyridine bases, etc.

Industrial Technology. Modern Technology of the Coal Tar Industry (La technique moderne de l'industrie des goudrons de houille), M. C. Berthelot. Revue de Métallurgie, vol. 17, nos. 2 and 4, Feb. and April 1920, pp. 63-92, 14 figs. and 252-261, 11 figs. Survey of processes for continuous distillation of tar. Processes for the complete transformation of tar into rosin.

COAL-TAR CHEMICALS

Statistics of. Statistics of Coal Tar Chemicals. Gas Age, vol. 45, no. 1, Jan. 10, 1920, pp. 6-13. From special report no. 11 of U. S. Tariff Commission for 1918 entitled Census of Dyes and Coal Tar Chemicals.

COAL TIPPLES

Combination Type. Rail and River Tipple Dumps Coal Inside and Conveys Coal by Belts, Donald J. Baker. Coal Age, vol. 18, no. 14, Sept. 30, 1920, pp. 583-586, 7 figs. Tipple at Allegheny River equipped to load coal for shipment by either rail or water.

Installations. A Coal Tipple for a Stripping Operation, Frank J. Schraeder, Jr. Coal Age, vol. 17, no. 15, Apr. 8, 1920, pp. 698-701, 4 figs. Tipple, designed to handle 250 tons of coal per hour, consists of housed receiving hopper of 35 tons capacity, feeder, steel apron-type elevating conveyor, Jacobsen balanced horizontal picking-table screens, refuse storage, lump loading boom and compact power plant.

Modern Coal Tipple in the Pittsburgh Field, R. G. Lawrig. Coal industry, vol. 3, no. 7, July 1920, pp. 328-329, 1 fig. Gives complete description of one of most modern tipples recently placed in operation and illustrating the engineering features required in a modern coal preparation and sizing plant.

New Coal Tipple of the Consolidation Coal Company, William Brasack. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 678-682, 9 figs. Prepares coal from three drift mines and ultimate capacity will be 5000 tons per day. Tipple is built of steel and has been designed with a view to secure safety and simplicity of operation.

Plant and Tipple of the Allied Coal Co. Coal Industry, vol. 3, no. 4, April 1920, pp. 177-180, 3 figs. Account of stripping operation at Sonora, Muskingum County, Ohio. Tipple is designed to handle 250 tons of coal per hour.

COAL WASHING

Efficiency. Coal-Washing; Further Scientific Studies, Thomas James Drakeley. Trans. Instn. Min. Engrs., vol. 59, part 2, May 1920, pp. 71-93 and (discussion), pp. 93-99, 4 figs. Determination of washer efficiency.

Equipment. Purification of Coal, B. J. Roberts. Cement, Mill & Quarry, vol. 15, no. 10, Nov. 20, 1919, pp. 11-13. Also Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 49-51. Data in regard to uses of concentrating table and accessory equipment, compiled from results of experimental work conducted by corporation of Fort Wayne, Ind.

Examination of Coal. The Examination of Coal in Relation to Coal Washing, M. Wynter Blyth and L. T. O'Shea. Colliery Guardian, vol. 117, no. 3051, June 20, 1919, pp. 1477-1478. Comparison of analysis interpreted as showing that between 85 and 95 per cent. of coal substance floats in liquids of 1.35 specific gravity and in liquids of between 1.4 and 1.48 specific gravities comparatively small quantities float; also that as far as seams examined are concerned all the material sinking in 1.48 specific gravity is not coal for coking purposes. Paper read before Instn. Min. Engrs.

Float Material. Coal Washing: Further Scientific Studies, Thomas James Drakeley. Colliery Guardian, vol. 119, no. 3089, March 12, 1920, pp. 747-748, 2 figs. Results obtained in experiments conducted to determine percentage of float material in solutions of different specific gravity are given in tabulated and diagrammatic forms. Paper read before Manchester Geological & Min. Soc.

Guarantees, Standardization of. Some Suggestions for the Standardization of Guarantees for Coal-Washeries, Sherwood Hunter. Trans. Instn. Min. Engrs., vol. 58, no. 1, Nov. and Dec. 1919, pp. 1-5 and (discussion) pp. 5-10. Concerning significance of such terms as "free coal in the dirt washed out," "free dirt in the washed coal," "fixed ash in the coal," etc.

Modern Practice. Modern Practice in Coal Washing, Horatio C. Ray. Coal Age, vol. 17, no. 1, Jan. 1, 1920, pp. 2-9, 8 figs. Also in Coal Industry, vol. 2, no. 12, Dec. 1919, pp. 535-543, 9 figs. Survey of processes. Writer advises using jigs for treating coal 1.2 in. in diameter or larger, and reciprocating tables for sizes below ½ in. It is said that coal which contains mechanically mixed impurities can be successfully washed after being crushed sufficiently to free these impurities.

Technical Considerations. Studies of Coal Washing (Études sur le lavage des charbons), Andre Moreau. Revue de Métallurgie, vol. 16, no. 6, Nov.-Dec. 1919, pp. 416-435, 7 figs. Technical consideration involved in designing water process for a given kind of coal.

COAL WEIGHING

Devices for. Coal Weighing Devices and Meters. Power Plant Eng., vol. 24, no. 1, Jan. 1920, pp. 70-72, 6 figs. Their construction and mode of operation.

COALING SHIPS

See COAL HANDLING, Coaling Ships.

COALING STATIONS

See LOCOMOTIVES, Coaling Stations for.

COALOMETER

See COAL, Temperature Indicators; COAL STORAGE, Temperature in Pile.

COAST DEFENSE

Plotting Stations. Plotting Station Organization and Equipment, E. J. Cullen. Jl. U. S. Artillery, vol. 52, no. 6, June 1920, pp. 584-604, 7 figs. Outline of organization and equipment of a plotting station that would be suitable for use with any type of land armament used against naval surface craft. Notes on matériel of plotting station, meteorological computations, etc.

COBALT

Cobalt Brass. See BRASS, Cobalt.

Passivity of. Passivity of Cobalt, Horace G. Byers and Curtis W. Thing. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1902-1908, 1 fig. Series of measurements of anodic potentials of iron, nickel and cobalt are given. Results show that at low current densities cobalt when used as anode readily goes into solution.

Production in U. S. See MINERALS, Production in U. S.

COCOANUT OIL

See TANKS, Concrete.

CODES, ELECTRIC

See ELECTRIC TRANSMISSION LINES, High-Tension.

COFFERDAMS

Thin-Wall. New Type of Thin-Wall Cofferdam. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 817-818, 4 figs. Combined steel and timber piles form sectional design giving low cost, stiffness and watertightness.

COHESION

Chemical Affinity and. Considering Cohesion and Chemical Affinity as Similar Forces, Felix Michaud. Brass World, vol. 15, no. 11, Nov. 1919, pp. 335-336. Relation between stability of compound and degree of molecular association of its components.

Electrical Nature of. The Electrical Nature of the Cohesion in Solid Bodies (Ueber die elektrische Natur der Kohäsionskräfte fester Körper), M. Born. Annalen der Physik, vol. 61, no. 1, Jan. 8, 1920, pp. 87-106, 1 fig. Writer refers to the elastic compressibility of halogen salts, and seeks to derive from the given hypothesis of molecular force all the other properties of such crystals.

COILS

Electric Apparatus. See ELECTRICAL MACHINERY, Dipping and Baking Coils.

Electromagnets, Heating of. See ELECTROMAGNETS, Heating of Coils.

Flat, Self-Inductance of. On the Self-Inductance of Single-Layer Flat Coils, S. Butterworth. Phys. Soc. of London, vol. 32, part 1, Dec. 15, 1919, pp. 31-37. Two formulæ are established for computation of self-inductance of single-layer flat coils, one for case when inner and outer radii are not very different and other for case of small inner radius.

Radio. See RADIOTELEGRAPHY, Coils.

Types. Universal, Honeycomb and Lattice Coils, O. C. Roos. Wireless Age, vol. 7, no. 11, Aug. 1920, pp. 23-26, 7 figs. Development of lattice layer on a plane, spiral lattices, winding peculiarities of lattices, in relation to derivation of formulæ, etc.

Wrappers. Thermal Conductivity of Coil Wrappers, T. S. Taylor. Elec. World, vol. 75, no. 7, Feb. 14, 1920, pp. 369-371, 2 figs. Test specimens are wrapped upon a heating element according to standard coil specifications. It is shown that the thermal conductivity may be determined by measuring the power required to heat the insulation and temperature rise.

COKE

Blast-Furnace, Moisture in. Moisture in Blast Furnace Coke, Wm. H. George. Jl. Soc. Chem. Indus., vol. 38, no. 22, Nov. 29, 1919, pp. 394T-396T. Method of determining it.

By-Product, Hygroscopicity of. Hygroscopicity of By-Product Coke, W. A. Selvig and B. B. Kaplan. Jl. of Indus. and Eng. Chem., vol. 12, no. 8, Aug. 1920, pp. 783-784. Tests show that dry pulverized by-product coke rapidly absorbs moisture in appreciable amounts and that different cokes vary considerably by hygroscopicity.

By-Product, Superiority of. By-Product Coke and By-Products of Coal, T. E. Pierce. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 283-287. Survey of development of by-product coke ovens. Tests at University of Illinois and at laboratories of American Radiator Co. are said to have established superiority of by-product coke over other cokes.

Handling. See COKE HANDLING.

Heating and Power. Coke for Heating and Power Purposes (Koks für Heizund Kraftzwecke) Pradel. Gesundheits-Ingenieur, vol. 42, no. 36, Sept. 6, 1919, pp. 361-372, 21 figs. Description of various types of boilers fired with coke in various forms; results of tests made. New distillation process at low temperature, yielding carbocoal, is especially mentioned.

House-Heating Furnace Fuel. Why and How Coke Should Be Used for Domestic Heating, Henry Kreisinger and A. C. Fieldner. Dept. Interior, Bur. Mines, Technical Paper 242, 1919, 19 pp., 1 fig. Based on experiments conducted at Bur. of Mines on burning of coke and other fuels in house-heating furnaces.

Manufacture. See COKE MANUFACTURE.

Moisture Content of. Moisture Content of Blast Furnace Coke, William H. George. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 154-157. Study of methods of correctly determining amount of moisture in coke for use in blast furnace with notes on liabilities of error.

Ovens. See COKE OVENS.

Plants. See COKE PLANTS.

Quality, Criteria of. Carbon Blisters and Carbon Threads are said to be Evidence of Good Coke. Coal Age, vol. 18, no. 4, July 22, 1920, pp. 173-174, 1 fig. Undecomposed hydrocarbons at bottom of oven rise into fierce glow of upper part of charge, where they split, leaving pure carbon on coke faces.

COKE BREEZE

Briquetting. Manufacture of Briquets from Coke Breeze (Feuerungstechnik und Koksabfallbriketts), P. Max Grempe. Feuerungstechnik, vol. 8, no. 4, Nov. 15, 1919, pp. 29-34, 10 figs. Details and illustrations of a plant and process for the manufacture of briquets from coke breeze, which it is said constitutes a marked advance in fuel technology that should be of great benefit to Germany and other countries.

COKE HANDLING

Gas-Works Equipment. Charlestown Coal Equipment, Walter V. Turner. Gas Rec., vol. 17, no. 7, Apr. 14, 1920, pp. 11-14, 5 figs. Mechanical apparatus for handling coal and coke in Massachusetts gas plant.

Machinery for. Mechanical Coke Loading and Unloading Machinery (Mechanische Kokslösch- und -verladeeinrichtungen), A. Thau. Glückauf, vol. 55, nos. 40, 42, 43 and 44, Oct. 4, 18, 25 and Nov. 1, 1919, pp. 769-773, 809-815, 829-834 and 853-855, 27 figs. Description and illustrations of various devices of recent design and construction. Recommendation for utilization of heat from coke ashes. The Swedish author claims that mechanical handling of coke has come to a standstill in England, whereas it has made great progress in Germany.

Systems. Handling of Coke. Times Eng. Supp., no. 536, June 1919, p. 189. Mechanical systems.

COKE INDUSTRY

By-Product. Progress in the By-Product Coke Industry, C. R. Bellamy. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 321-326, 8 figs. Description of modern practices and methods exemplified in Ford plant. Coke-oven gas. Market for by-products. Ammonium sulphate. Light oil and gas enrichment. Tar.

COKE MANUFACTURE

By-Product Plant, Sydney, N. B. By-Product Plant for Sydney, C. E. Wallin. Gas Age, vol. 45, no. 2, Jan. 26, 1920, pp. 69-73, 5 figs. There are two batteries, each consisting of 60 standard Koppers regenerative ovens. Heating is effected by combustion of part of gas generated during carbonization, gas being supplied alternately to pusher and coke sides of ovens.

Coking Illinois Coal. Coking of Illinois Coal in Koppers Type Oven, R. S. McBride and W. A. Selvig. Dept. Commerce, Technological Papers of Bur. Standards, no. 137, Nov. 17, 1919, 51 pp. Also in Coal Age, vol. 17, no. 4, Jan. 22, 1920, pp. 162-168, 6 figs. Operating test at St. Paul plant of Minnesota By-Product Coke Co. conducted jointly by Nat. Bur. Standards and Bur. Mines.

Crushing and Washing Apparatus. Crushing Coal in By-Product Coke Industry. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 21-22. Illustrates operation of modern type of crushing and washing apparatus.

Foundry By-Product. Making Foundry By-Product Coke, Edward H. Bauer. Foundry, vol. 48, no. 13, July 1, 1920, pp. 509-516, 18 figs. Proper blending of coals and knowledge of ratio of heat applied to oven area said to be essential. Some common points to observe in judging coke are noted. Abstract of paper presented before New England Foundrymen's Assn.

Manufacture of Foundry Coke, Edward H. Bauer. Gas Rec., vol. 18, nos. 1 and 2, July 14 and 28, 1920, pp. 15-21, 12 figs., and 21-24 and 46, 10 figs. Method used by Providence Gas Co. in making high-grade fuel, together with details of coke-oven plant. Effect of various coal mixtures and quenching upon quality of metallurgical coke produced.

COKE-OVEN GAS

Alcohol from. See ALCOHOL, Coke-Oven Gas as Source of.

Economical Utilization. The More Economical Utilisation of Coke-Oven and Blast Furnace Gases for Heating and Power, G. W. Hewson and S. H. Fowles. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 211T-214T. It is pointed out that by building coke-ovens near blast furnaces and steel works about half the gas generated can be utilized.

Natural-Gas Shortage and. By-Product Ovens—Natural Gas, C. J. Ramsburg. Gas Age, vol. 45, no. 10, May 25, 1920, pp. 456-461. Comprehensive review of relations and possibilities of coke ovens in meeting anticipated natural-gas shortage. Advantages of ovens are enumerated. Paper presented before Natural Gas Assn.

Tar Removal. Removing Tar from Coke Gas, A. Thau. Iron Trade Rev., vol. 66, no. 22, vol. 67, no. 1, May 27, 1920, pp. 1535-1538, 5 figs., and nos. 4 and 8 (Aug. 19, 1920). Illustrated serial. Separating tar drops or bubbles from coke oven gas by condensing, washing, friction or concussion. Length of main, speed and cooling as factors in condensing method. Improvements insuring finer distribution of gas and proper adjustment of parts of plant to correct temperature. Washers provided with revolving mechanisms. Extractors of concussion type combined with other apparatus. Recently constructed machines.

Town Supply. Coke-Oven Gas for Town Supply, Harold E. Wright. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 214T-216T. Writer advocates that in all places where it can be adopted regenerative coke oven producing metallurgical coke is from thermal point of view most efficient means for gas manufacture, and that, compared with ordinary gas-works returns as published, if it can be adopted, it can supply cheaper and better gas to town consumer at prices nearer true thermal value.

COKE OVENS

American vs. Foreign. American Coke Plants Superior to Foreign, J. I. Thompson. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 22-24. Because, it is said, foreign plants are not far advanced and are hampered by labor conditions.

Beehive, Waste-Gas Utilization. Waste Gases from Beehive Ovens Supply Power Needed in Star Junction Plant, Clyde R. Weihe. Coal Age, vol. 18, no. 10, Sept. 2, 1920, pp. 479-481, 3 figs. Heat given off by ordinary beehive oven during coking process may be conducted to and through boiler or boiler plant, thus generating enough power for all mining purposes. Heat per oven in 48-hour cycle supplies 21 b.hp.

British. Extensions to the Victoria Works of the Ebbw Vale Company, Ltd. Iron & Coal Trades Rev., vol. 101, no. 2741, Sept. 10, 1920, pp. 321-327, 28 figs. 16 on 2 supp. plates. Details of the coke ovens which are all of the Koppers regenerative type with vertical flues; sulphuric acid plant capable of producing 20 tons of 80-per cent acid per day from pyrites fines; concentrators of improved Perrin type, furnaces, condensers, boiler plant, dolomite shop, generating station containing two 5000-kw. 3000-r.p.m. Oerlikon turbo-alternators and two 2000-kw. Willans-Siemens turbo alternators, etc.

By-Product. Coke Ovens and By-Product Plant at the Lewis Merthyr Collieries, W. T. Lane. Colliery Guardian, vol. 119, no. 3104, June 25, 1920, pp. 1785-1789, 14 figs. Battery consists of 40 ovens said to be capable of carbonizing 1550 tons of coal per week.

La-Belle Iron Works By-Product Plant. Coal Industry, vol. 3, no. 3, Mar. 1920, pp. 143-146, 4 figs. Plant has two batteries, each of 47 standard Koppers 12¼-ton ovens and each planned to permit duplication.

Modern By-Product Coke Oven Construction, W. A. Ward. Colliery Guardian, vol. 120, no. 3107, July 16, 1920, pp. 169-171. Also in Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 198T-211T, 9 figs. Discussion of type of oven to be used, general features of design, armature, working of ovens, etc.

New By-Product Coke Ovens at Birmingham, W. B. Bridge and J. M. Hastings, Jr. Iron Age, vol. 106, no. 7, Aug. 12, 1920, pp. 380-382, 4 figs. Plant of 120 Semet-Solvay ovens, with complete equipment for recovery of ammonia, coal tar, benzol, toluol, solvent naphtha, naphthalene and motor benzol. Power is generated at central station by two 3600 r.p.m., d.c. general electric turbo units of 2000 kw. each and distributed at 6600 volts to various mining properties of company.

Post-War Conditions in Europe, with Some Comparisons of American and European By-Product Coke-Oven Practice, John I. Thompson. Proc. Engrs. Soc. Western Pa., vol. 35, no. 9, Dec. 1919, pp. 427-444 and (discussion) pp. 445-448. In tour of inspection of European coke ovens differences with American practice noted by writer were multiplicity of units used for handling small tonnage, practice of quenching immediately in front of oven, and much longer coking time employed.

Power Plant Features of a By-Product Coke Oven, W. F. Sutherland. Can. Machy., vol. 23, no. 11, March 11, 1920, pp. 107-112, 15 figs. Description of coke ovens of Steel Company of Canada.

COKE PLANTS

Recent By-Product Coke Oven Developments, Joseph Becker and F. W. Speer, Jr. Coal Industry, vol. 3, no. 6, June 1920, pp. 281-288, 6 figs. Also Blast Furnace and Steel Plant, vol. 8, no. 6, June 1920, pp. 330-336, 6 figs. Koppers ovens. Triangular flue system, its advantages and resultant increased efficiency secured by installation. Paper read before Blast Furnace & Coke Assn.

Developments in 1919. Technical Progress of Coke Ovens Reviewed, F. T. Moran. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 18-20. By-product coke oven development is divided into three periods—experimental, short coking and present period. Each of these is discussed with reference to particular installations.

Drying Coal for. Drying Coke-Oven Coal Centrifugally in one Continuous Automatic Operation, Carl Wendell. Coal Age, vol. 18, no. 3, July 15, 1920, pp. 108-110, 3 figs. Development of centrifugal drying machines and their advantages.

Economical Operation. Precautionary Measures for Coke Oven Plants in the Case of Reduction of Output or Coal Shortage (Massnahmen für Koksofenanlagen bei Betriebseinschränkungen oder bei Kohlenmangel), H. Hilgenstock. Zeitschrift für das Berg-, Hütten- u. Salinenwesen, vol. 68, no. 1, 1920, pp. 17-21. Points out measures to be taken in case of reduction of operation in plants with several batteries and in plants with only one battery; and in the case of coal shortage or strikes.

Koppers. See By-Product.

Refractories for. Investigation into the Properties of Refractory Materials Used in Coke Oven Construction. Gas World, vol. 71, no. 1837, Oct. 4, 1919, pp. 21-24. Results of research at Imperial College of Science and Technology, England. Experiments are claimed to have shown that presence of water favors actual incorporation of alkali into refractory. Investigation also covers action of "salty" coals and experiments of washing.

Semet-Solvay. See By-Product.

Technical Progress. Technical Progress of Coke Ovens Reviewed, F. T. Moran. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 47-49. Developments made in eliminating labor and maintenance costs employed about plants are especially noted.

Temperature Changes in. Temperature Changes in Coke Ovens, A. H. Middleton. Iron & Coal Trades Rev., vol. 100, no. 2705, Jan. 2, 1920, pp. 20-21, 2 figs. Conditions said to have produced large quantities of paraffin hydrocarbons in crude benzol and rectified product made in coke oven works. Paper read before Northern Section of Coke Oven Managers' Assn.

United States, 1919. Official Report of Coke Industry in 1919. Coal Age, vol. 17, no. 15, Apr. 8, 1920, pp. 702-704. From returns made to United States Geological Survey. Number of ovens under construction fell from 1815 in beginning of 1919 to 853 in beginning of 1920. Total number of ovens built and under construction is 11,232.

Walls, Corrosion of. The Corrosion of Coke-Oven Walls, W. J. Rees. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 197T-198T. Experimental evidence is said to indicate that corrosion is likely to be much more severe on fireclay than on silica, alumina, or magnesite bricks.

COKE PLANTS

By-Product. By-Products Coke, J. F. Springer. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 422-425, 6 figs. Plant near Jersey City, with 165 ovens arranged in single row, divided into three sections of 55 ovens each.

Condensation in Coke Plants (Sur la condensation dans les cokeries), E. Orè. Technique Moderne, vol. 12, no. 1, Jan. 1920, pp. 7-11, 21 figs. Comparative value of industrial by-product distillation processes.

Eighty-Oven By-Product Coke Plant of the Steel Co. of Canada at Hamilton. Contract Rec., vol. 34, no. 48, Nov. 26, 1919, pp. 1085-1090, 6 figs. Details of making coke for blast furnace use.

La Belle Coke Plant, G. P. Blakiston. Chem. & Met. Eng., vol. 22, no. 12, March 24, 1920, pp. 561-563, 8 figs. Plant has two batteries, each of 47 standard Koppers 12½-ton ovens and is planned to permit duplication.

La Belle Iron Works By-Product Plant. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 149-152, 4 figs. Plant has two batteries, each of 47 standard Koppers 12¼-ton ovens. Bridge 1520 ft. in length, maintains uninterrupted fuel supply.

Making By-product Foundry Coke in New England, H. R. Simonds. Iron Trade Rev., vol. 66, no. 21, May 20, 1920, pp. 1467-1471, 9 figs. Isolated gas and coke-making plant in Rhode Island devotes attention to cupola fuel. By-product coke used more generally in New England because of restrictions on transportation of beehive oven fuel. Relation of low- and high-volatile coals in coke-making.

New By-Product Plant at Indiana Harbor. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 12-16, 7 figs. Plant expected to have capacity for coking at least 74,000 net tons of coal per month, and screened furnace-coke product will amount to at least 45,000 tons per month.

The By-Product Coke Plant of the Algoma Steel Corporation at Sault Ste. Marie, Ontario, Wm. Seymour. Iron & Steel of Canada, vol. 2, no. 10, Nov. 1919, pp. 262-268, 8 figs. Addition of 50 Wilputte ovens, increase of coal storage space and installation of additional primary cooler.

The By-Product Coke Ovens at Anyox, B. C., and the Cassidy Colliery of the Granby Consolidated Mining and Smelting Co. Iron & Steel of Canada, vol. 2, no. 10, Nov. 1919, pp. 272-276, 6 figs. Following by-products are obtained: Benzol, toluol, solvent naphtha, crude naphtha and xylol. Operation of ovens is described.

The Dominion Iron and Steel Company's Koppers By-Product Coke Plant at Sydney, N. S., C. E. Wallin. Iron & Steel Co. of Can., vol. 11, no. 11, Dec. 1919, pp. 291-298, 7 figs. Ovens are of standard regenerative type, 37 ft. 6 in. in length, 15¾ in. in width, and 8 ft. 7 in. in height from floor to top of coal.

Collieries. Coke Oven Plant at Hoyland Silkstone Collieries. Colliery Guardian, vol. 117, no. 3049, June 6, 1919, pp. 1343-1344, 4 figs. Plant comprises Luhrig coal washery and 37 Semet-Solvay ovens with power plant and other auxiliaries.

Fairmont, W. Va. Fairmont Coke Oven Plant, Charles V. Critchfield. Gas Rec., vol. 16, no. 12, Dec. 24, 1919, pp. 11-14, 4 figs. Details of large plant under construction in W. Va. to replace waning supply of natural gas in that district.

Hamilton, Ont., Steel Works. Making Coke for the Blast Furnace, W. F. Sutherland. Can. Machy., vol. 21, no. 19, Nov. 13, 1919, pp. 479-485, 16 figs. Operations of ovens installed at Hamilton plant steel company of Canada.

Wisconsin Steel Works. New Coke Plant at Wisconsin Steel Works, Gilbert L. Lacher. Iron

Age, vol. 106, no. 9, Aug. 26, 1920, pp. 507-513, 14 figs. Plant consists of two 44-oven batteries and auxiliary facilities for obtaining by-products from gas. Minimum coking time of ovens with normal supply of coal is 14 hours. In every 24 hrs. 1800 tons of coal are charged and 150 ovens are pushed.

COLD STORAGE

British Industry. The Cold Storage Industry in Great Britain: Its Present Position and Potentialities, J. Raymond. Cold Storage & Ice Assn. Proc., vol. 15, 1918-1919, pp. 55-73 and (discussion) pp. 73-82. United Kingdom has about 250 public cold stores of total capacity of about 33,000,000 cu. ft. Privately owned cold storage is estimated to be less than 5,000,000 cu. ft. Referring to figures given in Refrigeration Blue Book, where it is stated that refrigeration has lessened cost of handling consumption of meat of Great Britain, her present cold-storage facilities are considered to be insufficient.

Electrically Operated Plants. Large Installation of Synchronous Motors in Cold-Storage Plants. Elec. Rev. (Chicago), vol. 76, no. 8, Feb. 21, 1920, pp. 301-304, 5 figs. Storage capacity approximates 58,250,000 lb. Plant is electrically operated throughout and employs synchronous motors for all except small drives.

Modern Cold Storage Plant. Refrig. World, vol. 55, no. 1, Jan. 1920, pp. 11-12, 4 figs. Electrically-driven plant erected and operated by Seattle Port Commission.

Experimental Plant. Scientific Problems of Cold Storage Industries, W. B. Hardy. Cold Storage & Ice Assn. Proc., vol. 16, no. 1, 1919-1920, pp. 23-35 and (discussion) pp. 36-45, 1 fig. Writer points out the need for a cold store specially designed for experiments, divided into compartments each of which could be kept at a required temperature, with machinery capable of producing in some or all of the chambers a very low temperature if needed. It is claimed that, except on engineering side, food industry is backward in scientific sense, because fundamental science has not been developed.

Meats, Effect on. Some Application of Chemistry to the Frozen Meat Industry, A. M. Wright. Cold Storage & Ice Assn. Proc., vol. 15, 1918-1919, pp. 31-47 and (discussion), pp. 48-51. Account of investigations on effect of cold storage upon meats conducted in chemical laboratory of New Zealand Refrigerating Co., Ltd.

Operation and Maintenance. Cold Store Operation and Maintenance, E. L. Rees. Cold Storage & Ice Assn. Proc., vol. 16, no. 1, 1919-1920, pp. 49-57 and (discussion), pp. 58-69. A discussion of the rise in costs due to war. Rise of prices of coal and other accessories and especially of labor since 1914 is cited.

Plants. See ICE PLANTS, Atlanta, Ga.

[See also FROZEN-MEAT INDUSTRY, Research in.]

COLD-STORAGE INDUSTRY

Effect of War on. The Effect of the War upon the Cold Storage Industry, I. C. Franklin. A.S.R.E. Jl., vol. 6, no. 4, Jan. 1920, pp. 237-250 and (discussion) pp. 250-255, 15 figs. Points out many regulatory measures which were developed by U. S. Food Administration during war which were advantageous to cold storage industry and to the consumer generally. Includes charts showing cold storage holdings for various food products during years 1916-1920.

COLLECTIVE BARGAINING

See INDUSTRIAL RELATIONS, Collective Bargaining; STREET RAILWAYS, Collective Bargaining.

COLLIERIES

See COAL MINES, Collieries.

COLLOIDAL FUEL

See PULVERIZED COAL, Uses, Future.

COLLOIDS

Chemistry. Applied Colloid Chemistry, Wilder D. Bancroft. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 454-456. Summarized outline of present-day rôle of colloid chemistry as applied to solution of widely diversified theoretical and practical problems in inorganic and organic industrial chemistry.

Colloid Chemistry and Electrochemistry, Wilder D. Bancroft. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 10, pp. 105-120. Migration of colloidal particles under electrochemical potential, cataphoreses and electrical endosmose, functioning of diaphragm, are discussed; also effect of colloids on conductivity of solutions, action of electrolytes on living tissues, electrostatic precipitation of extremely small particles, electrification of air and of suspended dust clouds, and metallic fogs or mists in fused electrolytes.

Clay Suspensions. The Coagulation of Clay Suspensions and Silicic Acid, Otto M. Smith. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 460-472, 7 figs. It was found from experiments that dilute solutions of dialyzed and undialyzed silicic acid behaved toward electrolytes in same manner as concentrated solution with exception that proportionally more reagent was needed. Silicic acid retarded coagulation of clay suspensoids.

Colors of. The Colors of Colloids, Wilder D. Bancroft. Jl. Phys. Chem., vol. 23, no. 8 and 9, Nov. and Dec. 1919, pp. 554-571, 603-633 and 640-644. From technical considerations and propositions established by various investigators, several phenomena of colors of colloids are explained. It is thus for instance said that with very fine particles light which is ordinarily reflected selectively is transmitted by resonance, while light which is ordinarily transmitted is scattered; in this manner red color of massive gold is an effect of multiple reflection and green color of thin films of gold is produced by transmitted light. How color matter is contained in glasses and glazes. Color matter of gems.

Electric Double Refraction. Electric Double Refraction in Colloids (Elektrische Dobbelbrechung in Kolloiden), C. Bergholm and Y. Björnstähl. Physikalische Zeitschrift, vol. 21, no. 6, Mar. 15, 1920, pp. 137-141, 8 figs. Most important result of investigation is said to be that Au- and Ag-sols become double-refractory in electric field, from which it is evident that their particles have no spherical symmetry; and as this is the case for gold it is probably the case for other colloids as well.

Electrolytic Coagulation. Influence of Valency in Connection with Electrolytic Coagulation, Especially of Suspended Colloids (Ueber die Rolle der Wertigkeit bei der Elektrolytkoagulation besonders der Suspensoide), Wolfgang Ostwald. Kolloid-Zeitschrift, vol. 26, nos. 1 and 2, Jan. and Feb. 1920, pp. 28-39 and 69-81, 13 figs. Critical review of various theories of influence of valency in connection with electrolytic precipitation, with special reference to H. Freundlich's adsorption theory, from which an explicit quantitative relation between valency and precipitative capacity is developed. A graphic method is developed for a closer examination of quantitative results of existing theories and for determination of coagulation conditions of

a sol. It is concluded that none of existing theories are entirely satisfactory and that function of valency as deciding factor in these coagulation occurrences has been greatly overrated.

Ferric Oxide Sols. The Physical-Chemical Analysis of Metallic Oxide Sols (Die physikalisch-chemische Analyse der Metalloxydsole), Wolfgang Pauli. Kolloid-Zeitschrift, vol. 26, no. 1, Jan. 1920, pp. 20-23. Writer refers to his former work in collaboration with J. Matula in same journal (vol. 21, 49, 1917), in which theory that adsorption forms basis for electrolytic precipitation of ferric oxide sols is refuted and makes comparison of his standpoint with that of G. Varga (Kolloidchem. Beih. 9, 1, 1919). Report from laboratory for Physical-Chem. Biology, University of Vienna.

Kongo Rubine. The Change in Color of Kongo Rubine under the Influence of Reaction and the Action of Neutral Salts (Der Farbenumschlag des Kongorubins unter dem Einfluss von Reaktion und Neutralsalzwirkung), Heinrich Lüers. Kolloid-Zeitschrift, vol. 26, no. 4, Jan. 1920, pp. 15-20, 1 fig. Solutions of Kongo Rubine at a given reaction are said to turn immediately from red to blue, etc., and these phenomena are explained by the changes caused by the influence of the electrolytes present, in connection with which it may be assumed that adsorption phenomena also occur.

Properties. Properties and Electrical Preparation of Metallic Colloids (Proprietés et préparations électriques des colloides métalliques), Paul Bary. Revue générale de l'Electricité, vol. 7, no. 1, Jan. 3, 1920, pp. 3-21, 12 figs. Writer explains application of term colloidal to metallic suspensions, indicates causes capable of influencing them, and describes general conditions for preparation of metallic suspensions by a survey of researches of previous experimenters and account of his own work.

Research. Investigating Methods of the Institute for Colloidal Research at Frankfurt on the Main (Untersuchungsmethoden des Institutes für Kolloidforschung in Frankfurt a./M.), H. Bechhold. Chemiker-Zeitung, vol. 44, no. 62, May 22, 1920, pp. 381-382, 1 fig. Directions for the quick determination of degree of dispersity of colloidal solutions as applied at the institute. Describes Schemensky's improved form of the Traube stactometer.

Recent Work on Colloids, R. S. Willows. Chem. Age, vol. 2, no. 34, Feb. 7, 1920, pp. 148-149. Reference is made to result obtained by Bragg's method of studying crystal structure, with fine particles having very fully developed crystalline structure, to investigations relative to separation of minerals by frothing, and to studies of colloids undertaken with a view to develop theory of lubrication. Paper read before Chemical Section of Manchester Literary and Philosophical Society.

Sedimentation Registering. The Automatically Registering Sedimentation Apparatus and Its Application to Certain Problems of Colloidal Chemistry (Die automatisch registrierende Sedimentiervorrichtung und ihre kolloidchemische Probleme), Sven Odén. Kolloid-Zeitschrift, vol. 26, no. 3, Mar. 1920, pp. 100-121, 22 figs. Investigations of automatically registrable measurement of accumulation speed; mean and actual particle radius; reversible aggregation in suspensions; determination of period of aggregation; aggregation as result of removal of the electrolytic ions, etc.

Shape of Particles. Contribution to the Study of Non-Metallic Colloidal Particles (Contribucion al estudio de particulas coloidales no metálicas). Teofilo Isnardi. Contribución al Estudio de las Ciencias físicas y matemáticas, Universidad de la Plata, no. 38, Dec. 1918, pp. 289-300, 2 figs. Application of absorption of solutions to determination of shape of particles.

Synthesis of. Colloidal Synthesis by Means of the Undulatory Current Arc (Kolloidsynthese mittelst des Wellenstromlichtbogens). Göta Borjeson and The Svedberg. Kolloid-Zeitschrift, vol. 25, no. 4, Oct. 1919, pp. 154-158, 9 figs. Action of various metals and electrodes is described.

Theoretical Problems. On Problems Relative to Theory of Colloidal Particles (Algunos problemas referentes a la teoria de particulas coloidales), Richard Gans. Contribución al Estudio de las Ciencias físicas y matemáticas, Universidad nacional de la Plata, vol. 2, no. 43, Sept. 1919, pp. 369-376, 5 figs. It is demonstrated that in any sub-ultra-microscopic corpuscle there are three axes at right angles for which existing electric field coincides with electric moment excited. From principles of mechanics expression for distribution of colloidal particles in tube of centrifugal machine is deduced.

Theories. Solution Theory and Suspension Theory (Ueber "Lösungstheorie" und "Suspensionstheorie"), Richard Zsidmondy. Kolloid-Zeitschrift, vol. 26, no. 4, Jan. 1920, pp. 1-10. Argues that the theory that colloidal solutions are absolutely homogeneous, free from space discontinuities, is not correct, and that definition of solutions should be altered in order to avoid such misleading conceptions; in writer's opinion it is not advisable to use the term "solution theory of colloids."

[See also ELECTROLYTES; SOAPS, Colloid Chemical Studies; SOLUTIONS, Colloidal.]

COLORIMETRY

Nearly White Surfaces. The Colorimetry of Nearly-White Surfaces, A. H. Pfund. Jl. Franklin Inst., vol. 189, no. 3, Mar. 1920, pp. 371-379, 3 figs. Colorimeter designed to study of nearly white surfaces was constructed by taking advantage of circumstance that multiple reflections from similar surfaces accentuate selective reflection.

COLORS

Matching. See LIGHTING, Color Matching.

COLUMN APPARATUS

Glass. A Glass Column Especially Adapted to Rectification of Liquid Mixture Not Easily Separated and the Recovery of Escaping Solvents (Rektifikationssäule aus Glas, besonders geeignet zur Rektifikation schwer trennbarer Flüssigkeitsgemische und Wiedergewinnung flüchtiger Lösungsmittel), W. Eisner. Chemiker-Zeitung, vol. 44, no. 2, Jan. 3, 1920, pp. 11-12, 1 fig. Description and illustration of an apparatus designed and employed by author in the laboratory of a machine factory in Hanover.

COLUMNS

Base Plates for. Column Base Plates and Anchors (Säulenfussplatten und Anker), H. Janser. Eisenbau, vol. 11, no. 4, Feb. 27, 1920, pp. 111-113, 2 figs. Gives table for determination of column base plates and the necessary anchor cross-sections.

Concrete. Designing Concrete Columns with Cast-Iron Core, W. H. Rooney, Jr. Eng. News-Rec., vol. 84, no. 10, Mar. 4, 1920, pp. 459-461, 1 fig. Chart for designing hooped reinforced-concrete columns with cast-iron or steel vertical reinforcements. Allowable unit-stress on concrete is taken as 500 lb. per sq. in.

Experiments with Spirally Reinforced Concrete Columns With and Without Stone Cores at the Technical High School of Vienna (Versuche mit umschnürten Betonsäulen mit und ohne Steinkernen an der Technischen Hoch-

schule Wien). Beton u. Eisen, vol. 19, nos. 1 and 4-5, Jan. 8 and Mar. 4, 1920, pp. 10-13 and 44-46, 8 figs. Results of tests with two kinds of concrete, showing that with the richer mixture the utilization of core and influence of reinforcing decrease, in spite of which total strength increases.

Fire Tests of Concrete Columns, W. A. Hull. Concrete, vol. 16, no. 4, April 1920, pp. 172-174. Tests made at U. S. Bur. of Standards are claimed to have demonstrated columns made from concrete which does not spall under fire and provided with 1½-in. of protective concrete uniformly over reinforcements are capable of withstanding extremely severe fire of four hours' duration, and that two inches of reinforced protective concrete is sufficient when concrete has tendency to spall.

Permissible Loading of Columns with Spiral Reinforcement (Zulässige Belastung Spiralarmierter Säulen), H. Fuchs. Armierter Beton, vol. 12, no. 12, Dec. 1919, pp. 318-320. Presents table submitted by the German Committee for Reinforced Concrete with accompanying explanations.

Spirally Reinforced Concrete Columns with Stone Cores (Umschnürte Betonsäulen mit Steinkernen), Fritz Emperger. Schweizerische Bauzeitung, vol. 76, nos. 5 and 6, July 31 and Aug. 7, 1920, pp. 49-51, 6 figs., and 61-64, 7 figs. Not only an increase in load capacity of columns is effected through use of ashlar cores but also a greater reliability and the possibility of a more rapid dismantling of forms.

The Behavior of Concrete Columns Under Fire Test, Walter A. Hull. Am. Architect, vol. 116, nos. 2288 and 2289, Oct. 29 and Nov. 5, 1919, pp. 561-566, 5 figs., and 589-594, 5 figs. Gravels of three distinct types, all high in quartz, but in different forms and different amounts, gave less satisfactory results under fire conditions than concrete from lime stone, trap rock and blast furnace slag aggregates. Paper presented before Am. Concrete Inst.

Fire-Resistive. A Comparison of the Heat Insulating Properties of Some of the Materials Used in Fire-Resistive Construction, Walter A. Hull. Dept. Commerce, Technological Papers of Bur. Standards, no. 130, Nov. 12, 1919, 40 pp., 18 figs. partly on 6 supp. plates. Experimental investigation undertaken as preliminary to proposed investigation of fire-resistive properties of full-sized building columns.

Fire Tests. See Concrete; also CONCRETE CONSTRUCTION, REINFORCED, Fire Tests.

Fixed-End. See BEAMS, Fixed-End.

Formulas. See BRIDGES, RAILWAY, Steel, Specifications for.

Hooped Concrete, Fire Resistance of. Report of American Concrete Institute Committee on Fire Proofing. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, p. 717. Gives data from tests of round hooped columns of 15 in. in effective diam., and summary of amended recommendations made in report of committee.

Reinforced-Concrete. See Concrete.

Round Steel, Safe Loads for. Chart for Determining Safe Loads of Round Steel Columns, John S. Watts. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 761-762, 1 fig. Chart based on American Bridge Co.'s practice. Steel columns up to 3 in. in diameter are considered.

Steel. Provisional Working Stresses for Steel Columns, C. R. Young. Can. Engr., vol. 38, no. 5, Jan. 29, 1920, pp. 169-170, 1 fig. Formula for determining safe strength of pin-end columns based on "sum total of tests to date," and taking into account tests and recommendations of Am. Soc. C. E.

See also BRIDGES, RAILWAY, Steel, Design.

Stresses in. Stresses in Rods under Axial Pressure, Bent by Single Loads (Beanspruchung axial gedrückter, durch Einzellasten gebogener Stäbe) Karl Arnstein. Eisenbau, vol. 10, no. 7, July 1919, pp. 151-156, 5 figs. Equations.

See also Steel.

COMBUSTION

Air Preheaters. Recuperation of Heat in Products of Combustion with Air Preheaters (Sur la récupération de chaleur sensible dans les produits de la combustion par l'emploi de l'air chaud), G. Bastien. Chaleur et Industrie, no. 5, July-Aug. 1920, pp. 297-301. Results of tests showing economical value of air preheaters.

Air Required for. Air Required for Combustion, W. C. Stripe. Combustion, vol. 2, no. 5, May 1920, pp. 21-23, 2 figs. A graphic method is presented for determining quantity of air required for combustion and importance of maintaining proper relation of air and fuel is pointed out.

Air-Supply Control. Automatic Control of Combustion, C. G. Gray. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 649-651, 1 fig. Control of air supply to ashpit by variation in pressure of gases above grates.

Saving Fuel by Controlling Air Supply, Charles C. Phelps. Combustion, vol. 3, no. 4, Oct. 1920, pp. 46-48, 2 figs. Manual vs. automatic recorders.

Charts for Study of. Graphs for Studying Coal Combustion (Etablissement rapide du bilan thermione par le moyen d'abaques), Ch. De la Condamine. Chaleur et Industrie, no. 2, Apr. 1920, pp. 110-116, 5 figs. Graphs indicating volume of air needed for burning a given quantity of coal, calories contained in coal, losses in boiler furnace, etc.

Propagation of. Propagation of Combustion (Les régimes réguliers de propagation des combustions), L. Crussard. Technique Moderne, vol. 12, no. 6 and 7, June and July 1920, pp. 243-250, and 295-301, 5 figs. Combustion is divided into two general classes, detonation and deflagration. Method of propagation is studied theoretically in each case and diagrams are given.

Surface. Surface Combustion, A. E. Blake. Proc. Engrs. Soc. Western Pennsylvania, vol. 36, no. 3, Apr. 1920, pp. 145-174 and (discussion) pp. 175-204, 27 figs. Describes various apparatus for production and use of perfect mixture (homogeneous mixtures which contain air and gas in quantitative proportions for complete reaction), designed in accordance with nature of heating to be done and gas to be used. Illustrations of certain examples of furnace engineering giving idea of industrial application of surface combustion. Bibliography of subject of surface combustion is appended.

Thermal Efficiency of. Control of Thermal Efficiency of Combustion (Contribution au contrôle du rendement thermique des foyers), Victor Lebeau. Chaleur et Industrie, no. 4, July 1920, pp. 215-220, 4 figs. Graphs for evaluating heat and temperature of combustion, and heat losses.

[See also DRAFT; FLUE-GAS ANALYSIS.]

COMFORT STATIONS

Underground. Allentown, Pa., Builds Modern Underground Comfort Station, George Preston. Domestic Eng., vol. 93, no. 2, Oct. 9, 1920, pp. 52-55, 5 figs. Three kinds of pay stations in both sections. 25-cent booth provides bath-electric dryers used in place of towels. Station complete cost $40,000.

COMMUTATORS

Truing. The Truing of Commutators, W. F.

Sutherland. Power House, vols. 12 and 13, nos. 18 and 11, Nov. 5, 1919, June 5, 1920, pp. 438-486, 9 figs., and 268-270, 4 figs. Describes new type of commutator grinder which was adopted by U. S. Navy in all yards and on repair ships and which can be used on board ship, where lightness and extreme portability are desired; it weighs 325 lb. and resurfaces commutators up to 16 in. in length.

COMPARATOR

Screw-Thread. See SCREW THREADS, Comparator for.

COMPASSES

Gyroscopic. Gyro Compass Circuits, R. L. Witham. Sperryscope, vol. 2, no. 2, June, 1920, pp. 9-13, 7 figs. Schemes for merchant marine installations.

New Gyroscopic Compass (Ein neuer Kreiselkompass), O. Martienssen. Zeitschrift für Instrumentenkunde, vol. 39, no. 6, June 1919, pp. 165-180, 16 figs. Description and theory of new model, with reference to former study published in Zeitschrift f. Instrumentenkunde, vol. 32, p. 309, 1912.

The Electrical Gyro Compass, O. B. Whittaker. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 39-43, 7 figs. Principle of operation, manufacture and inspection. Abstract from lecture delivered before Am. Soc. of Mech. Inspectors.

The Gyroscope as Pilot of the Air (Der Kreisel als Lotse im Luftmeer). Deutsche optische Wochenschrift, no. 33-34, Oct. 27, 1919, pp. 309-312, 8 figs. Drexler patent electrically-driven gyroscopic steering indicator for aeroplanes, with over 20,000 r.p.m.

The Gyroscopic Compass: A Non-Mathematical Treatment Engr., vol. 129, nos. 3347 and 3349, Feb. 20 and Mar. 5, 1920, pp. 190-191, 11 figs., and 242-245, 7 figs. Feb. 20: Discusses what happens if vessel rolls or pitches when sailing on an inter-cardinal or quadrantal course with regard to its effect on steadiness of axle of compass. Notes on quadrantal error in connection with Sperry compass and with Brown compass. Mar. 5: Mechanical and electrical features of Anschutz (1910 and 1912), Sperry, and Brown compasses.

The Gyrostatic Compass, Sydney G. Brown. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 202-206, 10 figs. Description of Brown gyrocompass.

Magnetic. Testing of Magnetic Compasses, R. L. Sanford. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 382, June 18, 1920, pp. 273-279, 4 figs. Work of Bur. of Standards on magnetic compasses undertaken at request of War Department and United States Shipping Board, consisting of studies of behavior of various types of compasses, construction of special apparatus for testing purposes and special investigations.

The Dip Needle in Stratigraphy, H. R. Aldrich. Min. & Metallurgy, no. 163, July 1920, p. 33. Geological uses of dip needle and dial compass. (Abstract.)

Radio. See NAVIGATION, Radio Compass.

[See also MAGNETIC DECLINATIONS.]

COMPRESSED AIR

Acid Pumping with. See ACIDS, Pumping.

Cleaning, Uses in. Using Compressed Air for Cleaning Purposes, F. A. McLean. Can. Machy., vol. 23, no. 1, Jan. 1, 1920, pp. 1-3, 4 figs. Also in Power House, vol. 13, no. 2, Jan. 20, 1920, pp. 37-38, 4 figs. Explains how walls, ceilings, windows, shafting, electric motors, generators, transformers, machine tools, patterns, core boxes, benches, etc., can be quickly cleaned by compressed air.

Hydroelectric Plants. San Joaquin Light and Power Corporation's Kerckhoff Power Project, W. C. Collyer. Compressed Air Mag., vol. 25, no. 8, Aug. 1920, pp. 9757-9758, 3 figs. Compressed-air equipment at hydroelectric power development to utilize water of San Joaquin River at Auberry, Cal.

Moisture Troubles. Troubles Caused by Moisture in Compressed Air, F. A. McLean. Power House, vol. 13, no. 12, June 21, 1920, pp. 279-281, 3 figs. It is pointed out that after-coolers cool and dry air more thoroughly than is possible with best type of receiver, and so reduce to a minimum the troubles which follow use of wet air, and in addition remove some of oil which might be carried into receiver and perhaps to pipe lines, to detriment of air-supply hose.

Railway Terminals. St. Paul's New Union Depot Serving Ten Railroads, Francis Judson Tietsort. Compressed Air Mag., vol. 25, no. 8, Aug. 1920, pp. 9759-9761, 7 figs. Uses of compressed air in building structure and for testing air brakes for repair tools and for engine-house requirements.

Textile Uses. Textile Uses of Compressed Air. Textile World Jl., vol. 57, no. 2, Jan. 10, 1920, pp. 109-111, 1 fig. Outlines applications of positive pressures and vacuum in mills.

[See also AIR COMPRESSORS.]

COMPRESSORS

Air. See AIR COMPRESSORS.

Ammonia. See AMMONIA COMPRESSORS.

CONCENTRATION

Liquids. See HEAT PUMPS.

Ore. Recent Ore Concentration Developments by the Consolidated Mining and Smelting Co. of Canada, Ltd., R. W. Diamond. Can. Chem. Jl., vol. 4, no. 3, Mar. 1920, pp. 74-75. Results of laboratory tests for treatment of Sullivan ore and Rossland ore.

Pacific Coast Sands, Process for. Separating Metallics from Pacific Coast Sands, Henry E. Wood. Eng. & Min. Jl., vol. 109, no. 6, Feb. 7, 1920, pp. 398-399. Process for concentration of chromite, zircon, and other minerals. Tabling is followed by magnetic separation.

See also FLOTATION.

CONCRETE

Abrams' Proportioning Theory. See Proportioning.

Acid-Proofing. Acid Proof Coatings for Concrete Surfaces, Edward H. Berger. Concrete, vol. 16, no. 6, June 1920, pp. 267-269. Specifications for bituminous paints, bituminous enamels and bituminous mastics, prepared by U. S. Bur. of Standards.

Bituminous Acid-Proof Coatings for Acid-Proofing Concrete Surfaces. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, pp. 287-289. Condensed form of recommendations of Bureau of Standards as to coating of concrete floors, vats and tanks exposed to acids, oils and similar substances.

The Effect of Acids and Salts on Concrete (Einwirkung von Säuren und Salzen auf Beton), W. Petry. Bauingenieur (Successor to Armierter Beton), vol. 1, no. 1, Jan. 15, 1920, pp. 12-14. It is pointed out that concrete when exposed to water containing acids or salts should not be used without protection, and that protective coatings should be selected according to nature of water in question, its density and temperature.

Action of Water on. Flood Prevention Works at Troon, Ayrshire, and the Action of Sea Water on Concrete, E. R. Matthews. Surveyor, vol. 57, no. 1474, April 16, 1920, pp. 329-332, 5 figs. Also in Soc. Engrs. Jl. & Trans., vol. 11, no. 3, 1920, pp. 75-90 and (discussion) pp. 90-107, 6 figs. It is concluded from tests performed in connection with flood-prevention works that a 3:1½:1 mixture in air with granite and granite dust aggregate has very little higher compressive strength at end of three months after mixing than where river gravel and sand aggregate is used. It is also concluded that granite concrete should be used whenever possible for submerged works and broken brick should never be used as an aggregate. For tidal structures where concrete is alternately in air and in sea water, gravel concrete is considered as serviceable as granite concrete, but for structures permanently submerged in sea water latter mixture is recommended.

The Destruction of Concrete Structures by Leakage Water (Ueber Zerstörungen von Betonbauwerken durch Sickerwässer), H. Helbing and H. Bach. Zentralblatt der Bauverwaltung, vol. 39, no. 87, Oct. 25, 1919, pp. 520-522, 8 figs. Various examples of such destruction are cited. Writers believe in some cases it is possible to mitigate danger of chemical destruction of concrete by use of trass as addition to cement, as well as blast-furnace cement instead of portland cement; but doubt whether this would entirely eliminate danger. When nature of construction base or of ground- and leakage-water conditions is doubtful, it is advised to avoid concrete construction and substitute brick masonry laid in a rich cement mortar to which trass is added.

Aggregates. See Slag Aggregate.

Aggregates, Proportioning. Aggregate Proportions for Equal Strength Concrete, A. N. Johnson. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 964-966, 1 fig. Tables giving 135 combinations of fine and coarse aggregate producing equal strength concrete. Most of natural gravels included in tabulation.

Combined Washing and Mixing Plant Proportions Materials. Concrete, vol. 16, no. 4, April 1920, pp. 167-169, 1 fig. Gravel washing and screening plant, combined with mixing plant, used at Taylorsville Dam, Miami, Conservancy District, Ohio.

Surface Area of Sand Determined by Volume-Moisture Relations, R. B. Young and W. D. Walcott. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 243-245, 5 figs. Results of tests carried out in laboratories of Hydro-Electric Power Commission of Ontario as part of extended research being conducted there into problem of concrete proportioning.

Aggregates, Testing. Making Sure of the Concrete Batch. Sci. Am., vol. 123, no. 15, Oct. 9, 1920, p. 379, 1 fig. Apparatus for testing aggregates, developed at United States Bur. of Public Roads.

Aggregates, Unit Weight of. Concrete and Concrete Aggregates. Report of Committee C-9, Annual Meeting, Am. Soc. Testing Matls., June 22-25, 1920, 46 pp. Comparative study of various methods for determining unit weight of concrete aggregate. Rod method is concluded to be "most useful and satisfactory." A tentative standard is proposed for unit weight of aggregate for cement concrete.

Alkali Soils, in. Concrete in Alkali Soils and Waters, A. S. Dawson. Jl. Eng. Inst. of Canada, vol. 3, no. 10, Oct. 1920, pp. 476-493. Experimental work by Concrete Committee of Eng. Inst. of Canada. It has so far been found that in concrete of high density, where absorption of alkali ground water is mainly at surface of concrete, action is relatively slow and is largely in the nature of surface action, gradually extending to interior; presence of alkali soil solutions does not retard setting of cement; action is more rapid in weaker mixtures and mixtures of low density.

Concrete Mixtures in Alkali Soils, C. J. Mackenzie. Jl. Eng. Inst. Can., vol. 3, no. 4, Apr. 1920, pp. 176-181, 5 figs. Also in Can. Engr., vol. 38, no. 14, Apr. 1, 1920, pp. 344-346. Facts regarding effect of alkali waters on concrete; field tests by Bur. of Standards; concrete mixing research by Abrams and Edwards. Outline of experiments carried out in conjunction with committee on concrete of Saskatchewan Branch of Eng. Inst. of Can.

Attrition by Sea Water. The Attrition of Concrete Surfaces Exposed to Sea Action, J. S. Owens. Surveyor, vol. 57, no. 1463, Jan. 30, 1920, pp. 92-93. List of harder stones, showing percentage loss by attrition in tests. Paper read before Concrete Inst.

Blasting. Blasting Concrete, S. R. Russel. Cement & Eng. News, vol. 32, no. 3, Mar. 1920, pp. 34-36, 5 figs. Examples are quoted and opinion is expressed that concrete can be removed with explosives in all cases at great saving of both time and money.

Blocks. See CONCRETE BLOCKS.

Calcium Sulphate, Effect of. Effect of Calcium Aluminium Sulphate on Concrete. Eng. & Contracting, vol. 52, no. 27, Dec. 31, 1919, pp. 755-756. Means of preventing destructive action of double salt in concrete. Translated from Beton u. Eisen.

Chemical Uses. Concrete in Chemical Industry, Ewart S. Andrews. Chem. Age, vol. 1, no. 23, Nov. 22, 1919, pp. 612-613, 4 figs. Suitability of concrete for tanks and vats, with notes on effect of oils and other materials upon concrete.

Cold-Weather. Hyman Tannery Building, London, Ont., R. E. W. Hagarty. Can. Engr., vol. 38, no. 22, May 27, 1920, pp. 495-497, 8 figs. Main requirements for cold-weather concrete are enumerated. Outstanding points are said to be that concrete can be successfully constructed during winter without use of tarpaulins; and for same factors of safety, the beam, slab and girder type of reinforced-concrete design is undoubtedly a more economical method of construction for buildings than type known as flat-slab construction.

Compression Tests. Compressive Strength of Concrete in Flexure, W. A. Slater and R. R. Zipprodt. Can. Engr., vol. 39, no. 2, July 8, 1920, pp. 123-127, 8 figs. Description of special tests conducted at Lehigh University and Lafayette College, from which it is concluded that 45 per cent of the compressive strength of the concrete may be used as a working stress.

Planning Compression Tests on Concrete. Can. Engr., vol. 39, no. 10, Sept. 2, 1920, pp. 301-303. Instructions of Am. Soc. for Testing Matls. to govern coöperative tests.

Recommended Practice for Making Compression Tests of Concrete. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 51 pp., 18 figs. Report of tests made to determine effect of tannic acid on strength of concrete is included.

Concreting. See CONCRETING.

Consistency. An Apparatus for Determining the Consistency of Concrete, F. L. Roman. Eng. & Contracting, vol. 53, no. 9, Mar. 3, 1920, pp. 240-241, 1 fig. Results of experiments with truncated cones for slump tests of concrete.

The Consistency of Portland Cement, Mortar, and Concrete, H. G. Lloyd. Surveyor, vol. 57, no. 1477, May 7, 1920, pp. 401-402. De-

scribes simple means of ascertaining quantity of water required when mixing mortar or concrete. Abstract from paper read before Concrete Inst.

See also CEMENT MORTAR, Consistency of.

Construction. See CONCRETE CONSTRUCTION.

Construction Plant. Lay-Out of Contractor's Plant on Six-Story Concrete Building at Moncton, N. B. Contract Rec., vol. 33, no. 50, Dec. 10, 1919, pp. 1131-1136, 9 figs. Equipment for handling aggregates and mixing and placing concrete.

Curing. Soaking Concrete in $MgSiF_6$ and $Na_2Si_4O_9$ Solutions. Concrete, vol. 17, no. 1, July 1920, pp. 28-29, 6 figs. It is indicated that 1-1-2 concrete cured in magnesium fluosilicate solutions was improved in strength for three out of four different curing conditions. 1-2-4 concrete showed no appreciable change in strength for any of curing conditions in magnesium fluosilicate solutions, but slightly higher absorption in all cases. 1-2-4 concrete cured for various lengths of time in sodium silicate gave slightly higher strengths and slightly lower absorptive values for all different conditions. Tests were made by U. S. Bureau of Standards.

Dampproofing. See BUILDINGS, Concrete, Dampproofing.

Decay in Alkali Soils. Alkali Soils of Prairie Provinces Cause Decay of Concrete Structures, W. G. Chace. Contract Rec., vol. 34, no. 23, June 9, 1920, pp. 538-540, 2 figs. Research work being undertaken to save Winnipeg Aqueduct. Plan for uncovering and backfilling of lower portions of trench carrying pressure conduit with screened gravel in which an outletted vitrified tile is to be laid has so far been recommended.

Disintegration by Vacuum. Concrete Destroyed in Vacuum in Calaveras Dam Culvert. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1197-1198, 4 figs. Experience in temporary intake led to successful use of vent pipes to break vacuum in new design.

Elasticity, Modulus of. Modulus of Elasticity of Concrete, Stanton Walker. Structural Materials Research Laboratory, Lewis Inst., Chicago, Bul. 5, Jan. 1920, 92 pp., 38 figs. Compression tests were made on about 3500 6 x 12 in. concrete cylinders. Relation between modulus of elasticity and strength of concrete was studied for following variables: Size and grading of aggregate, kind of aggregate, quantity of cement, consistency of concrete, age at test, time of mixing, and curing conditions of concrete. It is said that tests showed that modulus of elasticity is affected by these variables in same manner as strength. Tests are reported which show that gage lengths over which deformations are measured do not appreciably affect determination of modulus of elasticity. From Proc. Am. Soc. for Testing Materials.

Electric Resistance. Concrete in Connection with Electrical Accidents (Beton und elektrischer Unfall), Stefan Jellinek. Beton u. Eisen, vol. 19, nos. 2-3 and 4-5, Feb. 4 and Mar. 4, 1920, pp. 27-29 and 47-49. Results of investigations carried out at different times and places of electrical resistance of concrete and the changes in concrete caused by electricity, based on works by Berndt and his collaborators.

Electrolysis. Electrolysis in Concrete, E. B. Rosa, Burton McCollum and O. S. Peters. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 42-44. Observations of previous investigators that passage of current from iron anode into normal wet concrete caused destruction of test specimen by cracking concrete are said to have been experimentally confirmed.

Electrolysis of Concrete. Eng. & Contracting, vol. 52, no. 22, Nov. 26, 1919, pp. 611-612, 4 figs. Tests of Bur. of Standards described in Technologic Paper No. 18 show that reinforcing anode at very low current densities, rusting of iron and cracking of concrete eventually occur although damage may not be evident until lapse of from 4 to 8 years.

Fireproofing Wooden Buildings with. See FIREPROOFING, Concrete for.

Floors. See FLOORS, Concrete.

Flowability. Flowability of Concrete and Its Measurement by Means of the "Flow-Table," G. M. Williams. Eng. & Contracting, vol. 53, no. 2, June 2, 1920, pp. 623-625, 4 figs. Also in Can. Engr., vol. 38, no. 24, June 10, 1920, pp. 545-547, and Concrete, vol. 16, no. 6, June 1920, pp. 274-277, 4 figs. Investigation in concrete laboratory of Bur. of Standards and measuring apparatus used.

Hardening. See FLOORS, Concrete, Hardeners for.

Housing, Employment in. Warning Against Too General Employment of Concrete for Housing Purposes, Irving K. Pond. Contract Rec., vol. 34, no. 19, May 12, 1920, pp. 433-435. Writer claims it has, however, a legitimate use which should be encouraged, and summarizes its elements and qualifications.

Jarring, Effect on. Influence of Jarring on the Strength of Concrete (Der Einfluss von Erschütterungen auf die Festigkeit des Betons), Hans Schäfer. Prometheus, vol. 31, no. 18, Jan. 31, 1920, pp. 140-142. Results of experiments carried out in the Saxon Mech-Technical Experimental Inst., Dresden, are said to show that a slight jarring before setting begins will have a favorable effect on strength of concrete; during setting period its influence varies and precautions should be taken; after cement is hardened no apparent effect is noted.

Light. Resisting Power of Light Concrete (Sur les bétons légers: Calcul de l'augmentation de puissance que leur emploi procure à l'art de bâtir), Charles Rabut. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 452-454. Formulæ are given which show maximum strength of light concrete and its possible applications to building of large chimneys, etc., are visualized.

Lime in. See LIME, Hydrated.

Miami Conservancy District. Concrete for Miami Conservancy District Work. Public Works, vol. 48, no. 21, June 5, 1920, pp. 487-490, 5 figs. Excavating, preparing, grading and storing aggregate. Testing and proportioning materials. Mixing and delivering concrete. Experimental determination of most desirable mixture of sand, gravel, and mortar, with tables of voids and density for different sizes of aggregates.

Mixing Machinery. American Concrete Mixing Machinery. Engr., vol. 130, no. 3374, Aug. 27, 1920, pp. 193-197, 12 figs. Designs of mixture drums with stationary axis.

Mixing Methods. Bettering Concrete by a New Mixing Method, Nathan C. Johnson. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 723-728, 4 figs. Effect of violently stirring cement and sand together in water illustrated by photographs indicating hydration brought about by internal friction.

Motion-Picture Study. Better Concrete, Nathan C. Johnson. Sci. Am. Supp., vol. 88, nos. 2284 and 2285, Oct. 25 and Nov. 8, 1919, pp. 236-237 and 251, and 276-277, 15 figs. Oct. 25: Motion picture studies of existing conditions; suggested improvements. Nov. 8: Motion picture studies of air voids, effects of violent stirring, disintegration and softening.

Pipe. See PIPE, CONCRETE.

Pouring. Pouring Concrete through 50-ft. Well Holes. Ry. Maintenance Engr., vol. 16, no. 7, July 1920, pp. 255-256, 6 figs. Tunnel relined in a manner that saved labor and expedited completion. Practically entire work of moving concrete materials, the forms and other equipment, performed by gravity.

Preservation. See Acid-Proofing.

Pressure Against Forms. Pressure of Concrete Against Forms, E. B. Smith. Concrete, vol. 15, no. 7, July 1920, pp. 460-463. Summary of data seems to show: (1) Maximum pressure exerted upon forms increases as rate of filling increases; (2) field tests made where distance between form walls differed indicate that maximum pressures obtained increase slightly with mass of concrete when consistency is wet and sloppy; (3) maximum pressure was increased as consistency of concrete was made drier within the limit of workability. Paper read before Am. Concrete Inst.

Pressure of Concrete on Forms Measured in Tests, E. B. Smith. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 665-667, 4 figs. Account of tests performed in laboratory of research section of Bureau of Public Roads at Arlington Experimental Farm near Washington. It was found that maximum pressure was increased as consistency of concrete was made drier within limits of workability. Richness of mix was also found to affect maximum pressure obtained, the richer the mix the greater being the maximum pressure. Empirical formula is given for computing lateral pressures.

Pressure of Green Concrete Against Forms, E. B. Smith. Concrete, vol. 16, no. 3, Mar. 1920, pp. 158-161, 5 figs. Results of experiments made by U. S. Bur. of Public Roads indicated that fundamental pressure of concrete against form was about 1 lb. per sq. in. for first foot of head. It was also found that maximum pressure increased as consistency of concrete was made drier within limit of workability.

Pressure of Plastic Concrete Against Forms, E. B. Smith. Contract Rec., vol. 34, no. 22, June 2, 1920, pp. 501-503. Results of tests indicating nature of forces and laws of their action. Empirical formula for design of forms is developed. Abstract of paper presented before Am. Concrete Inst.

Proportioning. Analysis of Concrete Proportioning Theories, Roderick D. Young. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 735-738, 11 figs. Also in Can. Engr., vol. 37, no. 22, Nov. 27, 1919, pp. 487-490, 11 figs. Comparative study of conclusions arrived at by Prof. Duff A. Abrams, Lewellyn N. Edwards and Bur. of Standards.

Applying Abrams' Water-Ratio to Proportioning Concrete, Stanton Walker. Concrete, vol. 16, no. 6, June 1920, pp. 261-266, 1 fig. Examples are worked out illustrating method.

Are Abrams' and Edwards' Theories Both Wrong? G. M. Williams. Can. Engr., vol. 38, no. 3, Jan. 15, 1920, pp. 133-137, 2 figs. Writer holds that both theories are faulty and upholds conclusions in Bur. of Standards Technical Paper No. 58 that "no standard of compressive strength can be assumed or guaranteed for concrete of any particular proportions made with any aggregate unless all the factors entering into this fabrication are controlled," and "the relative compressive strength of concrete to be obtained from any given materials can be determined only by actual tests of those materials combined in a concrete."

Bulking Measurements of Surface Area, Roderick B. Young and William D. Walcott. Can. Engr., vol. 38, no. 21, May 20, 1920, pp. 475-478, 6 figs. Describes new method of determining surface area of sands or mixtures of sand and gravel based on volume-moisture relation which, it is said, requires no mechanical analysis. It is claimed that described tests seem to bear out contentions of Edwards and authors that surface area must be taken into account in any method of proportioning concrete mixtures. Paper read before Am. Soc. for Testing Materials.

Determination of Surface Area of Sand by Volume-Moisture Relation, R. B. Young and W. D. Walcott. Contract Rec., vol. 34, no. 35, Sept. 1, 1920, pp. 825-827, 4 figs. Tests carried out in laboratories of Hydroelectric Power Commission of Ontario as part of extended research being conducted there into problem of concrete proportioning. Paper read before Am. Soc. for Testing Materials.

"Fineness Modulus" and "Surface Area" Methods of Proportioning Concrete Mixtures, G. M. Williams. Eng. & Contracting, vol. 53, no. 4, Jan. 28, 1920, pp. 96-99, 2 figs. Study of test data offered by proponents of fineness modulus and surface area methods. Conclusions arrived at by supporters of both of these theories are criticized, particularly in regard to exposition of phenomenon involved in flowability, and experiments are suggested to determine further points which in opinion of writer are not clearly established by these theories.

Mixing Concrete by Surface Areas on Actual Work, Roderick B. Young. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 33-37, 4 figs. How concrete proportions are controlled and varied on construction work of Hydroelectric Power Commission of Ontario. System is based on combination of theories of Prof. Duff A. Abrams of Structural Materials Laboratory of Chicago, and L. N. Edwards, bridge engineer of Toronto.

Practical Application of Surface Area Method, Roderick B. Young. Can. Engr., vol. 38, no. 1, Jan. 1, 1920, pp. 101-106, 4 figs. Method for proportioning materials for concrete, used by Hydro-electric Power Commission of Ontario.

Proportioning Concrete From Study of the Aggregate, G. M. Williams. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 811-813. Comment on paper Mixing Concrete by Surface-Areas on Actual Work, by R. B. Young, in Eng. News-Rec., Jan. 1, 1920, and reply by Mr. Young to one of the criticisms.

Volume-Moisture Relation in Sand and a Method of Determining Surface Area Based Thereon, R. B. Young and W. D. Walcott. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 91-94, 6 figs. It is concluded from tests that surface area must be taken into account in any method of proportioning concrete mixtures.

Reinforced. See CONCRETE, REINFORCED; CONCRETE CONSTRUCTION, REINFORCED.

Research. Notes on Recent Developments in Concrete, H. C. Boyden. Jl. Am. Water Works Assn., vol. 7, no. 5, Sept. 1920, pp. 672-682. Research work conducted at Structural Materials Research Laboratory at Lewis Institute, Chicago.

Recent Advances in Concrete Practice. Ry. Maintenance Engr., vol. 16, no. 9, Sept. 1920, pp. 334-336. Summary of work undertaken at Structural Matls. Research Laboratory established in 1914 at Lewis Inst., Chicago.

Rodding, Effect of. Effect of Rodding Concrete, F. E. Giesecke. Am. Soc. for Testing Matls., Twenty-Third Annual Meeting, June 22-25, 1920, 10 pp., 3 figs. Also in Can. Engr., vol. 38, no. 2, Jan. 8, 1920, pp. 118-119, 2 figs.; Concrete, vol. 16, no. 2, Feb. 1920, pp. 102-103, 1 fig.; Eng. & Contracting, vol. 54, no. 8, Aug. 25, 1920, pp. 184-186, 3 figs.; and

Eng. World, vol. 17, no. 2, Aug. 1920, pp. 89-91, 3 figs. Tests at Univ. of Texas. Graph is given showing comparison of Prof. D. A. Abrams' curve with strengths of rodded concrete, water-cement ratios being based on quantity of water in concrete before and after rodding.

Improving Concrete by Rodding, F. E. Giesecke. Am. Architect, vol. 116, no. 2284, Oct. 1, 1919, pp. 467-469, 2 figs. Account of tests made at Univ. of Texas. It was found that effect of rodding of concrete is more beneficial with lean than with rich mixes and also more beneficial with wet than with dry mixes.

Sea Water, Effects of. Concrete in Sea Water, J. L. Harrison. Concrete, vol. 15, no. 5, Nov. 1919, pp. 198-200, 4 figs. Deductions from investigations made in Philippine Islands.

Steel in Concrete Construction in Sea Water, J. L. Harrison. Concrete, vol. 15, no. 6, Dec. 1919, pp. 236-239. Deductions from investigations made in Philippine Islands.

See also Action of Water on; Attrition by Sea Water.

Shearing Strength. Concrete Shear Values Proposed to Concrete Institute. Eng. News-Rec., vol. 84, no. 10, Mar. 4, 1920, pp. 465-469, 15 figs. Report of Committee on Unit Values for Vertical Shear of American Concrete Institute, presented to annual convention, Feb. 16, 1920. Report establishes unit values and standards of design based on survey of available tests.

Slag Aggregate. British Blast-Furnace Slag in Concrete. Iron Age, vol. 104, no. 25, Dec. 18, 1919, pp. 1251-1252. British and American slags are compared.

Specifications. See CONCRETE, REINFORCED, Specifications.

Stress-Deformation Relations. Some Determinations of the Stress-Deformation Relations for Concretes under Repeated and Continuous Loadings, G. M. Williams. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 18 pp., 10 figs. Also in Eng. & Contracting, vol. 54, no. 8, Aug. 25, 1920, pp. 190-192, 4 figs. It was found in tests that true stress-deformation relation for concrete is linear up to within 50 to 70 per cent of ultimate strength of concrete; that value of modulus of elasticity for concrete in wet and dry condition is a constant; and that with a given cement and aggregate, and for any fixed proportion of cement to aggregate there is a definite relation between modulus of elasticity and compressive strength for ordinary range of consistencies used in practice.

Surface Finishes. New Developments in Surface Treated Concrete and Stucco, J. C. Pearson and J. J. Earley. Concrete, vol. 16, no. 3, Mar. 1920, pp. 111-114, 8 figs. Method of obtaining permanent colors in concrete surfaces.

Treating Concrete Surfaces, Albert M. Wolf. Eng. World, vol. 16, no. 2, Jan. 16, 1920, pp. 73-76, 4 figs. Comparative value of various surface finishes.

Tension Tests. Tests of Concrete in Tension, T. H. Carver and J. H. Quense. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 1005-1006, 4 figs. Made in connection with installation of reinforced-concrete pipe line for City of Seattle. Briquets in rich mix 5 in. square at breaking section were broken under loads varying from 268 to 430 lb. per sq. in.

Tests. Effect of Vibration, Jigging and Pressure on Fresh Concrete, Duff A. Abrams. Jl. Eng., Inst. Can., vol. 3, no. 4, Apr. 1920, pp. 181-188, 16 figs. Results of tests made as part of experimental studies of concrete and concrete materials being carried out through coöperation of Lewis Inst. and the Portland Cement Assn.

How Can Laboratory Tests of Concrete Materials Be Made of Greater Value to the Field Engineer and Contractor, G. M. Williams. Eng. & Contracting, vol. 53, no. 8, Feb. 25, 1920, pp. 213-215. Discusses lack of agreement on tests and methods; laboratory methods that sometimes are source of error, etc. Probably the greatest cause for divergence between laboratory results and field practice is said to be the lack of some method for properly measuring and expressing the consistency, workability, or flowability of a mortar or concrete mixture.

Tile, Manufacture of. Wightman Tile Plant Involves New Ideas in Quantity Production, Harvey Whipple. Concrete, vol. 17, no. 1, July 1920, pp. 3-7, 9 figs. Machine and auxiliary equipment designed for maximum of automatic operation in producing equivalent of more than 10,000 brick per hour.

Trimstone. Concrete Trimstone and Building Ornaments, Adolph Schilling. Concrete Products, vol. 18, no. 6, June 1920, pp. 15-18. Deals with methods of manufacture, treating surfaces, colored concrete and curing. Report presented before Nat. Conference on Concrete House Construction.

Uniform Laboratory Testing. How Can Laboratory Tests of Concrete Materials Be Made of Greater Value to the Field Engineer and Contractor, G. M. Williams. Can. Engr., vol. 38, no. 5, Jan. 29, 1920, pp. 172-174. Disregard of field engineer for laboratory tests and conclusions is blamed to "lack of progress in developing laboratory methods of testing," and rules are formulated for laboratory testing with a view to making it possible to establish common basis for comparison of tests made at different laboratories.

Vibration, Effect on. Effect of Vibration, Jigging and Pressure on Fresh Concrete. Mun. Jl. & Public Works, vol. 48, no. 3, Jan. 31, 1920, pp. 43-45, 2 figs. Also in Bul. 3, Structural Materials, Research Laboratory, Lewis Inst., Nov. 1919, 23 pp., 16 figs. From tests and experiments at Lewis Inst. it is concluded that vibration and jigging are of no benefit where concrete has been thoroughly hand-puddled and that pressure on puddled concrete increases its strength by expelling superfluous water.

Watertight. Watertight Concrete. Nat. Lime Assn., bul. no. 301, 1920, 20 pp. 12 figs. Summary of facts concerning effects of hydrated lime in improving structure of reinforced concrete and rendering it impermeable to water, together with comments and field data concerning beneficial effects resulting from its use.

Water-Works Construction. Concrete in Water Construction, A. C. Irwin. Can. Engr., vol. 38, no. 3, Jan. 15, 1920, pp. 142-147, 9 figs. Its use in dams, reservoirs, pipe, filters, pump houses, standpipes and tanks.

CONCRETE BLOCKS

Block-Molding Machine. Concrete Cottage Building. Concrete & Constructional Eng., vol. 15, no. 3, Mar. 1920, pp. 173-181, 10 figs. Machine used by Australia Concrete Block Machine Syndicate for molding blocks 24 in. by 12 in. varying from 2 in. to 5 in. in thickness.

Brick vs. Comparative Cost of Laying Block and Brick, A. J. R. Curtis. Concrete, vol. 17, no. 4, Oct. 1920, p. 130, 1 fig. Figures obtained in actual cases show greater economy of concrete block.

Casting. Making Concrete Block for Miami River Revetment. Concrete, vol. 15, no. 6, Dec. 1919, pp. 227-229. Method developed for economical molding of blocks.

Slump Test. How to Use Slump Test for Better Block, A. J. R. Curtis. Concrete, vol. 17, no. 2, Aug. 1920, pp. 57-58, 4 figs. It is sug-

gested that slump test be made frequently in concrete plants as means of checking consistency of mixtures. It is recommended that slump test mold be made of No. 20 gage iron or heavier.

[See also CONCRETE CONSTRUCTION, Hollow-Block.]

CONCRETE CONSTRUCTION

Concreting Plants. Twin Concreting Plants for Large Foundation Area. Eng. News-Rec., vol. 84, no. 23, June 3, 1920, pp. 1107-1109, 2 figs. Towers instead of cables carry main chutes and have steep zigzag auxiliary chutes; the two plants are about 1200 ft. apart, easterly plant serving group of coke ovens and accompanying structures, while other serves work for blast furnace, power house and stock bins.

Cost Estimation. Estimating Concrete Buildings. Contract Rec., vol. 34, nos. 37, 38 and 40, Sept. 15, 22 and Oct. 6, 1920, pp. 868-871, 4 figs., 889-894, 7 figs., and 948-950. Method of preparing estimates for concrete buildings advocated by Aberthaw Construction Co.

Field Operations. Concreting Plant and Operations, Frank W. Skinner. Public Works, vol. 49, no. 4, July 24, 1920, pp. 83-85, 3 figs. General review of advanced practice in field operations, and equipment for important concrete construction.

Foundation Slabs. The Economical Design of Reinforced Concrete Foundation Slabs, Charles S. Higgins. Concrete & Construction Eng., vol. 15, no. 9, Sept. 1920, pp. 617-619, 6 figs. Advantages in use of economical concrete slabs over ordinary grillage foundations.

Gravel, Use in. Inspection of Workmanship in Concrete Construction, R. W. Crum. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, pp. 706-710, 3 figs. Three methods of using pit-run gravel are given as follows: (1) Enough cement may be used to make concrete of desired class from gravel without change; (2) gravel may be separated into sand and coarse aggregate by screening, and then remixed in predetermined proportions; (3) gravel may be made the equivalent of proportion in case 2, by adding coarse aggregate or sand as may be required. Abstract from field manual issued by Iowa Highway Commission for guidance of its inspectors.

Holland. The Use of Concrete in the Netherlands, A. E. Dinger. Concrete & Construction Eng., vol. 15, no. 9, Sept. 1920, pp. 620-624, 5 figs. Describes clarifying and sedimentation tanks in Wilhelmina State Mine, and a bridge on the Streyhagen Road.

Hollow-Block. The Economic Limitation of Hollow-Block Masonry (Die Grenzen der Wirtschaftlichkeit von Hohlsteinmauerwerk), Wilhelm Popovic. Beton u. Eisen, vol. 18, no. 17-18, Nov. 8, 1919, pp. 185-190. Formula is derived for calculating, with given price for 1000 bricks and given mixing proportions of concrete for concrete hollow blocks, maximum price of hydraulic cement per 100 kg., up to which the production of concrete blocks is more economical than that of brick masonry. Tabular data are given on use of solid and hollow concrete blocks.

Houses. See HOUSES, CONCRETE.

Porous Slabs. Porous Concrete Slabs Used in Building Construction. Building Age, vol. 42, no. 10, Oct. 1920, pp. 23-27, 7 figs. Describes new building material called Porete developed by E. Walter, Newark, N. J., which has received approval of building department of Newark.

Portable Track and Cars for. Use of Portable Track and Cars in Concrete Construction, William Wren Hay. Concrete, vol. 17, no. 4, Oct. 1920, pp. 128-130, 1 fig. Table giving costs of loading and unloading materials.

Pressure in Forms. Pressure of Concrete in Form, George Paaswell. Eng. & Contracting, vol. 53, no. 8, Feb. 25, 1920, pp. 208-209. Formula and tables.

CONCRETE CONSTRUCTION, REINFORCED

Adams System. The "Adams" System of Reinforced Concrete Construction. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 719-722, 5 figs. There are no structural walls because vaults spring directly from floor level and constitute both walls and roof.

Australian Structures. Typical Examples of Reinforced Concrete Structures in Australia, E. G. Stone. Commonwealth Engr., vol. 7, no. 7, Feb. 2, 1920, pp. 204-212, 15 figs. Structures illustrated and described are wheat silos, sewerage pipes, aqueduct, pontoons, etc.

Beams. See BEAMS, Concrete.

Cold-Weather. See CONCRETE, Cold-Weather.

Concreting. See CONCRETING.

Contractor's Plant. Contractor's Plant for Reinforced Concrete Construction. Concrete, vol. 16, no. 3, Mar. 1920, pp. 115-120, 2 figs. Plant showing method of operation used by Turner Construction Co. in construction of buildings for U. S. Aluminum Co., Edgewater, N. J.

Cost Estimation. Estimating Concrete Buildings. Contract Rec., vol. 34, no. 36, Sept. 8, 1920, pp. 850-856, 21 figs. Methods of Aberthaw Construction Co. of Boston.

Efas System. The Efas Construction System (Die Efas-Bauweise), A. Kleinlogel. Beton u. Eisen, vol. 18, no. 16, Oct. 3, 1919, pp. 169-172, 10 figs. Describes a new system characterized as hollow-block construction strengthened with reinforced concrete. These blocks are said to differ from one-piece blocks now in use in that they are built of two parts, which greatly facilitates construction and renders them simpler and more economical. System is claimed to meet present-day demand for economy of labor and material, as well as durability and protection against dampness and loss of heat.

Fire Tests. Fire Tests of Reinforced-Concrete Structures (Brandproben an Eisenbetonbauten), M. Gary. Deutscher Ausschuss für Eisenbeton, third report, no. 41, 1918, 38 pp., 21 figs. Results of tests made at Roy. Material Testing Station at Berlin-Lichterfelde-West, with photomicrographs.

Flat-Slab. Concrete Flat Slab Regulations. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 239-240. Adopted by New York City as standard.

New York City Concrete Flat-Slab Regulations. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 300-302, 2 figs. Standards adopted by Board of Standards and Appeals for uniform use of all boroughs of city.

New York City Regulations for Design of Reinforced Concrete Flat Slabs. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 89-91. Rules adopted by Board of Standards and Appeals governing design of reinforced-concrete flat slabs.

The Theory of Elastic Netting and Its Application in the Calculation of Elastic Plates (Die Theorie elastischer Gewebe und ihre Anwendung auf die Berechnung elastischer Platten), H. Marcus. Armierter Beton, vol. 12, no. 11, Nov. 1919, pp. 281-289, 5 figs. Writer discusses technical research methods for investigation of the plate theory, and the conditions under which problem can be solved.

Flexural Stresses. Reinforced Concrete Structures under Flexural Stresses (Cálculo de estructuras

de hormingón armado sometidas a la flexión compuesta), Julio R. Castineiras. Contribución al Estudio de las Ciencias físicas y matemáticas, Universidad Nacional de la Plata, no. 42, June 1919, pp. 97-233, 56 figs. Mechanical formulæ for determination of stresses in various fibers of sections of different shapes, including hollow bar; tables for designing and general investigation of most appropriate shape, especially for beams.

Office Buildings. Reinforced Concrete Office Buildings for New York City. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 233-235, 1 fig. Proportions for concrete used in building under construction for Western Electric Co. are generally 1 : 2 : 4 but in certain columns richer mixture is used. Specifications require use of 1½ in. stone.

Oval Basin. Calculations for an Oval Receiving Basin (Berechnung eines ovalen Sammelbehälter), Carl Ritter. Armierter Beton, vol. 12, no. 12, Dec. 1919, pp. 313-315, 4 figs. Formula derived by writer while designing receiving basin of oval shape for pump house of large plant.

Plant Buildings. Modern Industrial Plant Layout, A. F. Wells. Can. Manufacturer, vol. 40, no. 9, Sept. 1920, pp. 43-46, 3 figs. Reinforced-concrete building erected in Toronto for Prest-O-Lite Co. of Canada, Ltd., Can. Nat. Carbon Co., Ltd., and Dominion Oxygen Co., Ltd.

Rectangular Built-In Frame. Graphic Investigation of the Rectangular Built-In Frames Based on Theory of Elasticity Ellipse (Graphische Untersuchung des Rechteckigen Eingespannten Rahmens auf Grund der Theorie der Elastizitätsellipse), H. Polivka. Armierter Beton, vol. 12, no. 10, Oct. 1919, pp. 250-256, 13 figs. Stresses in cases of loading by single load outside of frame, uniformly distributed loads, horizontal loads, and frames with variable cross-sections.

Roof Trusses. Concrete Trusses and Cantilever Girders in Theatre. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 604-605, 4 figs. Roof cost reduced by substituting concrete for steel. Balcony has heavy girders and long cantilevers in theatre at Cleveland, O.

Shrinking of. Transversal Shrinking of Reinforced-Concrete Structures (Sur les effets transversaux du retrait dans les ouvrages en béton armé), G. Guillaumin. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 10, Sept. 8, 1919, pp. 465-467. Calculations based on empirical equations developed from experimental measurements. Reference is made to previous communications in Comptes rendus.

Slab. Design of Reinforced Concrete Slabs with Saw-Tooth Top, J. W. Pearl. Eng. and Contracting, vol. 54, no. 8, Aug. 25, 1920, pp. 178-179, 2 figs. Chart for graphical determination of coefficients in formula.

See also Flat-Slab.

Stairways. Dimensioning of Stairways Built-In on One Side (Dimensionierung Einseitig Eingespannter Treppenstufen), Carl Ritter. Armierter Beton, vol. 12, no. 10, Oct. 1919, pp. 256-262, 7 figs. Simplified formulæ are presented, based on general calculations, by means of which, with an assumed stress, it is possible to determine from bending moment the necessary altitude, adequate transverse reinforcement, and resultant moment of inertia.

Standards. Reinforced Concrete Design Standards, Edward Godfrey. Concrete, vol. 17, no. 3, Sept. 1920, pp. 85-89, 3 figs. Criticizes present practice in design of rodded columns and of stirrup or short shear members, and system of determining coefficients for bending moments in flat slabs.

Stresses in Rigid Frames. Problems in the Theory of Construction, Ewart S. Andrews. Concrete & Constructional Eng., vol. 15, nos. 2 and 3, Feb. & Mar. 1920, pp. 80-83 and 161-165, 5 figs. Formulæ for calculating stresses in rigid reinforced-concrete frames.

Waterproofing. Notes on Reinforced-Concrete Construction, Geo. Allen. Mech. World, vol. 66, no. 1712, Oct. 24, 1919, p. 200. Waterproofing; properties of reinforcing bars. Paper read before Junior Instn. of Engrs.

[See also BUILDINGS, Concrete; MINES, Reinforced-Concrete Construction in; WATER TOWERS, Reinforced-Concrete.]

CONCRETE MIXERS

See CONCRETE, Mixing Machinery; ROADS, CONCRETE, Machinery.

CONCRETE PIPE

See PIPE, CONCRETE.

CONCRETE, REINFORCED

Bending Stresses in. Method of Determining Stress in Reinforced-Concrete Cross-Sections Produced by Bending with Axial Pressure (Verfahren zur Spannungsermittlung in Eisenbetonquerschnitten bei Biegung mit Achsdruck), E. Elwitz. Zentralblatt der Bauverwaltung, vol. 40, no. 5, Jan. 17, 1920, pp. 29-30, 3 figs. Method described is said to involve less calculation and give quicker results than method commonly used.

Bonding. Bond Between Steel and Concrete, M. O. Fuller. Concrete, vol. 15, no. 5, Nov. 1919, pp. 201-203, 5 figs. Tests made both with concrete tamped parallel to axis of steel and with concrete tamped normal to axis. Comparison of results presented shows that concrete vertically tamped possesses much higher bond stress.

Building Construction, Use in. See BUILDING CONSTRUCTION, Reinforced Concrete.

Coal Mines, Use in. See COAL MINES, Reinforced Concrete, Use in.

Cracks, Formation of. Formation of Cracks in Reinforced Concrete and How to Limit Them (Rissbildung im Eisenbetonbau und ihre Beschränkung), R. Saliger. Zeitschrift des Oesterreichische Ingenieur- u. Architekten-Vereins, vol. 71, nos. 41 and 42, Oct. 10 and 17, 1919, pp. 375 and 384-385. Writer explains that all cracks in concrete are due to tensile stress, points out dangers of cracks and gives directions for limiting them. He also calls attention to certain mistakes that are often made.

Design and Construction. Reinforced Concrete Design and Construction, Past and Present, Ernest P. Goodrich. The J. E. Aldred Lectures on Engineering Practice, 1919-1920, Johns Hopkins University, Dept. of Eng., 1920, pp. 85-122, 46 figs.

Mine Applications. See MINES, Reinforced Concrete, Use of.

Piers. See PIERS, Coaling.

Present Status of. Elevating the Status of Reinforced Concrete, F. G. Engholm. Contract Rec., vol. 34, no. 3, Jan. 21, 1920, pp. 55-59, 6 figs. Tests of U. S. Bur. of Standards and Emergency Fleet Corporation are said to have proven fallacy of various by-laws which have been adopted for controlling stresses in reinforced concrete.

Present Status of Reinforced Concrete Design, F. G. Engholm. Can. Engr., vol. 38, no. 4, Jan. 22, 1920, pp. 151-155, 9 figs. Tests by Emergency Fleet Corporation are said to have indicated defects in present By-laws. Paper read before Toronto Branch of Eng. Inst. of Can.

Railway Work. See RAILWAY CONSTRUCTION, Reinforced Concrete, Uses of.

Specifications. Report of Committee on Masonry. Ry. Age (Daily Edition), vol. 68, no. 11, Mar. 17, 1920, pp. 862-867. Also in Bul. Am. Ry. Eng. Assn., vol. 21, no. 220, Oct. 1919, pp. 99-121. Specifications for plain and reinforced concrete and for billet-steel concrete reinforcement bars, recommended by committee of Am. Ry. Eng. Assn.

Wood Reinforcement. Concrete with Wood Reinforcement (Der Holzbeton), Fritz Emperger. Dinglers polytechnisches Jl., vol. 335, no. 10, May 15, 1920, pp. 109-112, 9 figs. Account of experiments and recommendations for its use.

[See also PLATES, Flat, Theory of.]

CONCRETING

Channel Lining. Lay Concrete Channel Lining with Large Traveling Form. Eng. News-Rec., vol. 84, no. 22, May 27, 1920, pp. 1056-1058, 6 figs. In improving Onondaga Creek at Syracuse, steel framework carrying concrete chute car moved along channel.

Distribution. Distribution of Concrete by Inclined Chutes. Engineer, vol. 128, no. 3326, Sept. 26, 1919, pp. 300-301, 2 figs. Traveling plants.

Installations for Distributing Concrete by Gravitation (Instalaciones para distribuir el hormigon por gravitacion), R. Eiriz Sequeiros. Ingenieria, vol. 23, no. 7, Oct. 1, 1919, pp. 277-294, 11 figs. Considerations in regard to selection of slope and mechanical details.

[See also CEMENT GUN.]

CONCRETING PLANT

See CONCRETE, Construction Plant.

CONDENSATION

Mist Occurrence. The Occurrence of Mist in Condensation Processes (Ueber das Auftreten von Nebeln bei Kondensationsprozessen), G. Weissenberger. Kolloid-Zeitschrift, vol. 26, no. 5, May 1920, pp. 212-213. An example is cited whereby, with the switching of stationary centrifugal separators, the aceton mist in the form of a spray can be brought to separation, and the content of the air leaving the apparatus can be reduced to 10 or 11 grams per cu. m.

CONDENSERS

Distillation. Condensers (Ueber Kühler), Fritz Friedrichs. Zeitschrift für angewandte Chemie, vol. 33, no. 8, Jan. 27, 1920, pp. 29-32, 6 figs. Review of different types of condensers, the most important of which are tested according to a method especially worked out. Efficiency of Soxhlet apparatus is found to be not in keeping with its cost; but spiral condensers, it is claimed, have a cooling effect which cannot readily be surpassed, and are feasible also as return-flow condensers.

CONDENSERS, ELECTRIC

Capacities of. Capacities and Condensers (Capacités et condensateurs), P. Bunet. Revue générale de l'Électricité, vol. 8, no. 8, Aug. 21, 1920, pp. 237-250, 11 figs. Comparative study of capacities of various forms of condensers. Examples are worked out of determination of capacities of electric circuits by means of their self-inductance. Opinion is expressed that it is possible to design high-powered condensers, which would be capable of being branched in derivation on high-tension high-power distribution systems.

High-Voltage. The Use of Condensers in High-Voltage Measurements (Ueber die Verwendung von Kondensatoren zu Hochspannungsmessungen), A. Imhof. Schweiz. Elektrotechnischer Verein Bul., vol. 11, no. 5, May 1920, pp. 99-104, 8 figs. Account of investigations to determine which condenser connections should be used with electrostatic voltmeters; it is shown that for precise direct-current instruments no series condensers should be used; effect of marginal discharges is explained; directions for protection of static instruments are given as well as a description of another type of static instrument.

Residual Discharge. Residual Discharge of Condensers (Sur la décharge résiduelle des condensateurs), Stephan Procopiu. Revue générale de l'Électricité, vol. 8, no. 4, July 24, 1920, pp. 99-100, 2 figs. Apparatus for demonstrating residual electrical refringency of Leyden jar.

Static. The Economy of Static Condensers. Frank Hershey. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 252-253, 3 figs. Experiences of two electric service companies.

Synchronous. Synchronous Condensers, E. B. Plenge. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 143-146, 5 figs. Requirements of machines for operation with lagging current are shown vectorially. Starting characteristics, ventilation and prevention of noise are also referred to.

Variable Capacity, Laboratory Use. Applications in Laboratory Work of Variable Capacity Condensers (Sur quelques applications dans les laboratoires des condensateurs à capacité variable), C. J. Petropoulos. Revue générale de Électricité, vol. 6, no. 24, Dec. 13, 1919, pp. 831-832. In such work as measuring difference of potential necessary to produce illumination in a tube, graduating of indirect measuring electrometer, etc.

CONDENSERS, STEAM

Air Pumps for. Air Pumps for Condensing Equipment, Frank R. Wheeler. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 926-930, 6 figs. After presenting classification of air pumps writer takes up features of each type and makes comparative study of their respective advantages and limitations, giving special attention to steam-jet ejector type of pump, for which extreme simplicity, reliability and flexibility, stability, low-steam consumption and high efficiency are claimed.

Auxiliary. Auxiliary Condensers, C. Walde Cairns and J. Morrow. Shipbuilding & Shipping Rec., vol. 15, no. 21, May 20, 1920, pp. 675-679, 5 figs. Abstract of report to Council of North-East Instn. of Engrs. & Shipbuilders on tests of auxiliary condensers, and tables of results of tests on all four types of condensers are given, with description of each type.

Report on Tests of Auxiliary Condensers, C. Waldie Cairns and J. Morrow. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 7, May 1920, pp. 381-424, 29 figs. Report of sub-committee appointed by Council of North-East Coast Instn. to carry out tests to determine relative performance of certain auxiliary condensers for use on board ship. It is pointed out that temperature of condensate is affected by relation of size of condenser to duty to be performed as well as by type and arrangement. Results of tests and comparisons are given in curves and tables.

Castings for. The Castings for a Condenser, Ben Shaw and James Edgar. Foundry Trade Jl., vol. 22, no. 223, July 1920, pp. 543-549, 22 figs. Description of pattern making.

Circulating-Water Flow. Chart for the Determination of Circulating-Water Flow. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 811-812, 1 fig. For checking up circulating-water flow in operation of surface condenser.

Circulating-Water Strainers. The Straining of Circulating Water. Eng., vol. 109, no. 2838, May 21, 1920, p. 679, 4 figs. Patented scheme

in which straining surface is outside of perforated drum built up of gun-metal plates on cast-iron spiders, one end of drum being closed and the other open to outlet for strained water.

Cooling-Water Equipment. See STEAM POWER PLANTS, Cooling-Water Equipment.

Naval. Service Experience with Condensers, G. B. Allen. Shipbuilding & Shipping Rec., vol. 16, no. 14, Sept. 30, 1920, pp. 395-396; also Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 423-424, 1 fig. Analysis of causes of failure of naval condenser tubes, with suggestions as to their prevention. Paper read before Inst. of Metals.

Tube Failures. The Failure of Condenser Tubes. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 142-145, 4 figs. Failures are said to be due to (1) splitting of tubes, and (2) corrosion. Preventives are suggested.

Tubes, Flow Through. Flow of Water Through Condenser Tubes, William L. De Baufre and Milton C. Stuart. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 949-951, 11 figs. Account of tests conducted at U. S. Naval Eng. experiment station, Annapolis, Md., to determine friction loss of water flowing through ⅝ in. no. 18 gage standard condenser tubes. Investigations covered variable velocities, water temperatures, and tube length as well as effect of both fresh and salt water.

Vacuum. Notes on Condenser Vacuum, F. R. Parsons. Eng. and Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 711-713, 1 fig. Results obtained by use of efficient air pump.

Vacuum Limitations. Limitations of High Vacuum in Actual Practice, A. D. Bailey. Elec. Rev. (Chicago), vol. 76, no. 25, June 19, 1920, pp. 1019-1020, 2 figs. Economical limits. Paper read before Nat. Elec. Light Assn.

[See also AIR PUMPS.]

CONDENSING PLANTS

See COOLING TOWERS.

CONDUCTIVITY

Electrolytic. See ELECTROLYTIC CONDUCTIVITY.

CONDUITS

Air Chambers in. Researches on Conduits with Air Chambers (Recherches sur les conduites possédant des réservoirs d'air), C. Camichel. Houille Blanche, vol. 19, nos. 41-42, May-June 1920, pp. 111-113, 6 figs. Experiments at Institut Electrotechnique de Toulouse to study behavior of conduits provided with devices for relief of water hammer.

Concrete. Excavation below Arch Bridge Foundations. Public Works, vol. 49, no. 10, Sept. 4, 1920, pp. 205-208, 4 figs. Concrete conduits 25 ft. wide constructed on opposite sides of railroad bridge pier and carried down 12 ft. below pier footings on gravel retained by steel sheet piles.

Greater Winnipeg New Water Supply. Engineer, vol. 128, no. 3330, Oct. 24, 1919, pp. 399-401, 3 figs. Profile and cross-section of reinforced-concrete conduit built with capacity of 85,000,000 gal. per day.

Method of Building Concrete Tailrace below Stone Arch Bridge Foundation Level. Eng. and Contracting, vol. 54, no. 7, Aug. 18, 1920, pp. 155-157, 5 figs. To keep gravel under grillages from caving in, line of interlocking steel sheet piling was driven on each side of excavation, and as material was dug out, bracing timbers were introduced between two rows of piling.

New Concrete Conduit for Denver Water Supply. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 551-553, 4 figs. Old wood-stave line replaced by concrete pipes made on ground from local material. Self-propelled pipe layer.

Reinforced Concrete Conduit under Pressure at the Rioupéroux Hydroelectric Plant (Conduite forcée en béton armé des usines hydro-électriques de Rioupéroux), A. Waechter. Schweizerische Bauzeitung, vol. 76, no. 6, Aug. 7, 1920, pp. 59-61, 6 figs. Diameter of conduit is 8¼ ft. Length is 2017 ft.

Construction. Constructing a 98-Kilometer Water Conduit in Chile, George H. Bayles. Eng. News-Rec., vol. 83, no. 13, Sept. 25, 1919, pp. 593-599, 10 figs. Problems presented by reason of lack of proper transportation facilities.

Resonance of Conduits Having an Air Pocket (Sur la résonance des conduites munies d'une poche d'air), A. Foch. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 16, Oct. 20, 1919, pp. 687-690. In former note (C. R. vol. 169, 1919, p. 569) writer deduced formula which established that conduit having air pocket can have two periods. In present note experiments are related in which volume and pressure of air in pocket were measured while conduit was resonated in successive periods.

Economical Design. The Economical Design of Water Conduits, W. T. Taylor. Engineer, vol. 128, no. 3326, Sept. 26, 1919, pp. 293-296, 8 figs. Graphs for determination of conduit cross section.

Electric-Cable. See CABLES, ELECTRIC.

Pressure, Reinforced-Concrete. Conduits Under Pressure (Conduites forcées), D. Eydoux. Houille Blanche, vol. 18, no. 160, Sept.-Oct. 1919, pp. 201-206, 5 figs. Structural details of reinforced-concrete conduits and steel conduits.

Standardization. Conduit Bodies Standardized by Manufacturers. Elec. Rev. (Chicago), vol. 77, no. 6, Aug. 7, 1920, pp. 207-208, 3 figs. Three-unit line of conduit bodies for exposed wiring, said to be of universal application for 0.5 and 0.75-in. conduit, armored conduits and any of the numerous wiring devices produced by various manufacturers.

Supporting Pillars, Spacing of. Spacing of Pillars Supporting a Pressure Conduit (Note sur le calcul de l'espacement des piliers supportant une conduite sous pression), H. Chenaud. Houille Blanche, vol. 18, no. 35-36, Nov.-Dec. 1919, pp. 245-246, 1 fig. Diagram giving distance for maximum permissible stress of 6 kg. per sq. mm.

Velocity Heads. Observations on Velocity Heads with Cross-Sectional Changes in Conduits (Beobachtungen über Geschwindigkeitshöhen bei Profländerungen in Kanälen), J. Büchi. Schweizerische Bauzeitung, vol. 76, no. 8, Aug. 21, 1920, pp. 85-88, 4 figs. Results of investigations and measurements carried out at conduit of the hydraulic plant of the Aluminum Industrial Corp. on Rhone River near Chippis.

Water Hammer. See WATER HAMMER.

CONNECTING RODS

Aeroplane-Engine. See AEROPLANE ENGINES, Connecting Rods.

Automobile-Engine. See AUTOMOBILE ENGINES, Connecting Rods.

Failure at High Speeds. Failure of Connecting Rods at High Speeds, G. Wiedeman. Automotive Industries, vol. 42, no. 23, June 3, 1920, pp. 1254-1255, 2 figs. There are said to be some disadvantages in tapering a connecting rod from a large section at crank end to a smaller one at piston. Use of hollow tubular rods for racing purposes is considered advantageous because section being uniform throughout is least affected by inertia at high speeds.

Forging and Heat-Treating. See AEROPLANE ENGINES, Connecting Rods.

Liberty Motor. See AEROPLANE ENGINES, Connecting Rods.

Machining. Connecting Rods for the Fordson Tractor, Fred H. Colvin. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 273-277, 17 figs. Attention is directed to three-point suspension method of holding and locating connecting rods during various machining operations.

Manufacture. Producing 17,000 Connecting Rods a Day, Fred H. Colvin. Am. Mach., vol. 52, no. 25, June 17, 1920, pp. 1305-1309, 15 figs. Describes boring of half hole, die-casting of bearings, assembling of rods and caps and final boring and broaching which brings center distance to length and makes rod ready for assembly department.

Stresses. The Strength of Connecting Rods, A. Johnson. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 352-354, 5 figs. Account of combined stresses due to thrust and "fling."

CONTACTS

Calculation. The Calculation of Contacts (Die Berechnung von Kontakten), Wilhelm Höpp. Elektrotechnische Zeitschrift, vol. 41, nos. 11 and 12, Mar. 11 and 18, 1920, pp. 205-208 and 232-235, 23 figs. With aid of oxidation measurements, directions are given for calculation of contacts, and calculation formula is developed under consideration of additional losses through contact resistances and influence of cross-sectional changes. It is shown that contact losses are practically independent of size of contact surface and only total pressure and cleanness of surfaces are of importance.

Improvements in. Contacts and Contact Material, H. von Fleischbein. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 19-20, 3 figs. Devices developed with view of preventing welding of contact points and neutralizing effect of dust on contacts. Translated from "Elektrotechnische Zeitschrift."

Resistance of. Contact Resistance (Ueber den Kontaktwiderstand), Franz Kraus. Elektrotechnik u. Maschinenbau, vol. 38, no. 1, Jan. 4, 1920, pp. 1-5, 6 figs. Account of experiments carried out for purpose of obtaining bases for calculation of contact resistance. Variation of intensity of current is said to show that the contact resistance follows Ohm's law. Results of investigations on effect of heating, temperature coefficient, and contraction, and effect of specific pressure with data for its calculation.

CONTRACT WORK

Cost Estimating. Items Which Estimators Sometimes Omit. Contract Rec., vol. 34, no. 22, June 2, 1920, pp. 498-500. Discusses five components of cost which it is stated should be included in any system of estimating if contracting service is to be fully paid for, namely, financial credit, constructive skill, use of plant, hazard and profit. Report of Committee on Cost Estimating of Northwestern Assn. of General Contractors.

Letting of. Ideal Contract-Letting Made Practicable, J. A. L. Waddell. Can. Engr., vol. 37, no. 24, Dec. 11, 1919, pp. 527-529, 2 figs. Suggested method of percent-sharing between contractor and client.

CONTRACTS

Cost-Plus. Contracts—A Comparison of "Cost-Plus" with other Forms, Ernest Wilder Clarke. Eng. World, vol. 15, no. 1, Nov. 15, 1919, pp. 15-17. Based on writer's experience during past few years with "cost-plus" form of contract.

Cost Plus Contracts for Water Works Construction, George W. Fuller. Fire and Water Eng., vol. 68, no. 4, July 28, 1920, pp. 191-193. Consideration of advantages and disadvantages of this form of contract. Legal right of municipalities to enter into such contracts.

Modified Cost Plus Contract for City Use, E. S. Dorr. Eng. & Contracting, vol. 53, no. 7, Feb. 18, 1920, pp. 178-179. Explanation of some of the provisions in competitive cost-plus contract for use of city or state prepared by writer, who is office engineer of Sewer Department of Boston, Mass.

Standard Form. Suggestions for a Standard Form of Contract, G. W. Buchholz. Jl. Am. Water Works Assn., vol. 7, no. 5, Sept. 1920, pp. 657-662. Based on Committee on Contracts of Associated General Contractors of America.

CONTROLLERS

Improvements in. Improvements in Contactor Types of Industrial Controllers, H. D. James. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 489-493, 12 figs. Explaining action and operation.

CONVERTERS

Frequency. Parallel Operation and Synchronizing of Frequency Converters, O. E. Shirley. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 136-139, 3 figs. Explanation for phase displacement which takes place between loaded and unloaded converters trying in same systems.

Rotary. Improvements in the Starting and Controlling of Rotary Converters. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 492-493, 5 figs. Scheme of connections of self-synchronizing converters of General Electric Co., Ltd. Essential features are specially designed synchronizing switch and choking coils.

Phasing-Out Rotary Converters, K. A. Reed. Power, vol. 52, no. 2, July 13, 1920, pp. 51-53, 6 figs. Method is outlined which required no other equipment than a number of lamps and special brushes.

The 5000-Kw. Rotary Converter of the Peiner Rolling Mill Corporation (Der 5000-KW-Einankerunformer der A.-G. Peiner Walzwerk), F. Hartig. Stahl u. Eisen, vol. 40, no. 25, June 24, 1920, pp. 845-848, 2 figs. Details of rotary converter and auxiliary equipment including switch plant. Economy of engine is pointed out.

Synchronous. Flashing of 60-Cycle Synchronous Converters and Some Suggested Remedies, Marvin W. Smith. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 4, April 1920, pp. 346-358, 26 figs. Methods of protection from flashing described. Quick-acting breaker, flash suppressor, and flash guards among devices used.

60-Cycle Converting Apparatus, J. L. Burnham. Gen. Elec. Rev., vol. 23, no. 5, May, 1920, pp. 392-398, 12 figs. Devices which have been developed to prevent flashing of commutator when converters used for voltages of 500 and 600 are subjected to short-circuits or quick changes in load.

The Technical Story of the Synchronous Converter, B. G. Lamme. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 21-26 and 59-72, 1 fig. Also in Elec. Jl., vol. 17, no. 3, Mar. 1920, pp. 91-99, 1 fig. Historical account of development. Studies undertaken at laboratories of Westinghouse Elec. & Mfg. Co.

CONVEYORS

Apron-Type. Kinlok Mine of the Valley Camp Coal Co., J. W. Marshall. Coal Industry, vol. 3, no. 7, July 1920, pp. 307-310, 3 figs. Description and operation of apron-type conveyor said to be largest now being used in U. S.

Belt. Elevating and Conveying Equipment. Coal

Trade Jl., vol. 50, no. 49, Dec. 3, 1919, pp. 1396-1397, 2 figs. Illustrating uses of belt conveyors.

Factors in the Life and Care of Conveyor Belting, James B. McPherson. Belting & Transmission, vol. 16, no. 4, Feb. 20, 1920, pp. 21-23, 4 figs. Careful treatment is said to insure efficiency and longevity. Illustrations of proper use of skirt-boards to prevent material rebounding off belt, and how screens in loading chutes act to feed fine ahead of heavier material and thus protect cover from abrasion.

Methods Used in the Installation of Conveyor Belts. Belting and Transmission, vol. 16, no. 5, March 5, 1920, pp. 27-30, 8 figs. Attention is called to precision required in putting big belt in place in order to secure efficient service and freedom from shut-downs for repairs.

See also Steel-Belt; BELTING, Conveyor, Rubber; COAL HANDLING, Belt Conveyors.

Belt, Wooden-Link. The Kaul Wooden Conveyor Belt [Das Holzglieder-Förderband (System Kaul)], Heinz Gante. Fördertechnik u. Frachtverkehr, vol. 13, no. 4, Feb. 20, 1920, pp. 41-42, 1 fig. Describes belt consisting of wooden links, 50x50x20 mm. jointed together horizontally with Mannesmann tubes, which is said to have been used successfully in anthracite, lignite, cement, food-products and chemical industries as well as for coaling plants.

Belt, Wooden-Slat. The Killewald Wooden Conveyor Belt (Das Holzgliedförderband "System Killewald"). Fördertechnik u. Frachtverkehr, vol. 13, no. 5, Mar. 5, 1920, pp. 56-57, 2 figs. Describes conveyor exhibited at the Leipzig Exposition by the Bernburg Potash Works, consisting of two parallel wire ropes to which narrow wooden slats are clamped to form the conveying surface, original feature of which lies in the arrangement and fastening of the bars on the wire ropes.

Electric. Electric Telphers for Chemical Works, Herbert Blyth. Chem. Age (Lond.), vol. 3, no. 60, Aug. 7, 1920, pp. 150-154, 7 figs. Discusses latest developments of electrically-operated conveyors and financial savings effected by using such conveyors in chemical works.

Electrically Operated. The Electrical Equipment of Fowey Harbour. Elecn., vol. 85, no. 2207, Sept. 3, 1920, pp. 269-275, 7 figs. Electrically-driven conveyor machinery and handling gear used for handling china clay at Great Western Railway's harbor at Fowey, Cornwall.

Foundry. See FOUNDRIES, Conveyors for.

Industrial. See HANDLING MATERIALS, Mechanical Equipment for.

Installation Details. Conveyor Installation at the Maypole Margarine Factory, George F. Zimmer. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 854-855 and 858, 10 figs. partly on supp. plate. Details for supporting and protecting plant.

Portable. Portable Conveyors and Transporting Trucks, C. J. Goodwin. Eng. & Indus. Management, vol. 4, no. 5, July 29, 1920, pp. 149-152, 4 figs. Various types are illustrated and their application explained.

Portable Stacking Devices Used in Goods-Sheds and Warehouses, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 3, Jan. 15, 1920, pp. 89-91. Simon portable unit conveyor. It consists of slat type machine generally 24-in. to 32-in. wide, composed of two matched strands of endless running chain in which every alternative link is provided with hard wood slat while intervening links are fitted with steel cross-bars.

Pulverized Materials. Progress in the Pulverizing of Hard Material (Neuerungen der Hartzerkleinerung), Carl Naske. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 32, Aug. 7, 1920, pp. 619-622, 12 figs. Deals with auxiliary equipment. Review of improvements in construction of conveyors for pulverized material. Description of mechanically operated troughs, apron conveyors and delivering devices; separation of finely pulverized material from a mixture of fine and coarse materials through sifting by means of air; transportation of thick and thin slimes, emptying of cement silos, and the automatic packing of barrels and sacks by means of compressed air.

Refrigerating Industry. Conveying Machinery in the Refrigerating Industry, Edwin McQueen. A.S.R.E. Jl., vol. 6, no. 5, Mar. 1920, pp. 344-363 and (discussion) pp. 363-368, 20 figs. Discussion of two main groups of conveyors, the gravity and the power group. States that important item in use of belt conveyor is type of belt to be employed; under wet conditions a rubber-covered belt should be used; in some cases a solid bed supporting the belt is preferable; local conditions must determine whether aprons on an apron type of conveyor should be of steel or wood. Illustrations of various types of conveyors.

Sand. See FOUNDRIES, Conveyors for.

Spiral. Notes on the Uses of Spiral Conveyors. Coal Trade Jl., vol. 50, no. 35, Aug. 27, 1919, pp. 1048-1049. Tables of capacities based on tests and experience with screw conveyor installations.

Steel-Belt. The Sandvik Steel Conveyor Belt (Stahlförderband System Sandviken), S. Michelson. Fördertechnik u. Frachtverkehr, vol. 13, no. 11, May 28, 1920, pp. 104-105, 4 figs. Describes a Swedish type of steel belt manufactured entirely in one piece in lengths up to 90 m., which is pliable, of small weight, rust-proof, is durable and easily connected and repaired.

Textile Mills. See TEXTILE MILLS, Conveyors for.

[See also STEAM POWER PLANTS, Auxiliary Apparatus.]

COOKING

Electric. See HEATING, ELECTRIC.

Fireless. See FIRELESS COOKERS.

COOLING LIQUIDS

Spray Systems. Cooling Liquids in Spray Systems and Cooling Towers, Edwin M. Baker. Chem. & Metallurgical Eng., vol. 22, no. 4, Jan. 28, 1920, pp. 173-176, 4 figs. Presents data obtained in testing Ceco spray system and discusses possible application of spray cooling for crystallizing work in chemical industries.

COOLING TOWERS

Holland. On Cooling Towers, E. K. Th. van Iterson. Elecn., vol. 84, no. 2197, June 25, 1920, pp. 690-692, 4 figs. Details of construction of cooling towers at central station of pit "Emma" Dutch State Collieries, Heerlen.

Reinforced-Concrete, Design. Stresses in Thin Shells of Circular Section, F. K. Th. v. Iterson. Engineering, vol. 108, no. 2811, Nov. 14, 1919, pp. 640-642. Theory of stresses in thin-walled bodies subjected to bending moments, with notes on design of reinforced-concrete cooling towers.

Selection of. Cooling Towers for Condensers, J. B. Harry. Am. Soc. Refrig. Engrs. Jl., vol. 6, no. 3, Nov. 1919, pp. 178-182 and (discussion), pp. 182-189, 1 fig. Factors influencing selection of water recooling apparatus.

[See also COOLING LIQUIDS.]

Spray Ponds vs. See SPRAY PONDS, Cooling Towers vs.

COOPERAGE

Operations in. The Cooperage Industry, Hu Maxwell. Universal Engr., vol. 30, no. 2, Oct. 1919, pp. 21-27, 13 figs. Illustrating various operations in manufacture of barrels, kegs, headings, hoops, and other articles made of staves.

COOPERATION

Industrial. Modern Attempts at Co-operation, James A. Bowie. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 749-750. Writer maintains there are at least three distinct lines along which coöperation is being developed, namely, shop committees, nationalization and joint control. He believes that workers' willingness is greatest factor in industry and gives causes for their present state of unrest.

COPPER

Alloys. See COPPER ALLOYS.

Brittleness. A Peculiar Type of Intercrystalline Brittleness of Copper, Henry S. Rawdon and S. C. Langdon. Technologic Papers, Bur. of Standards, no. 158, April 10, 1920, 5 pp., 4 figs. Also in Min. & Metallurgy, no. 158, Section 10, Feb. 1920, 4 pp., 3 figs. Concerning embrittlement of copper when heated in molten salt bath (sodium chloride) for cleaning or softening purposes. Embrittlement is explained by amount of metallic sodium formed by electrolysis which immediately alloys with copper.

Castings. Casting Copper in Spinning Molds, Louis J. Josten. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 910-913. Method of manufacturing cupro-nickel bands by centrifugal casting process.

Catalytic Activity. The Catalytic Activity of Copper, W. G. Palmer. Proc. Royal Soc., series a, vol. 98, no. A688, Sept. 1, 1920, pp. 13-26, 3 figs. Experiments with copper prepared electrically.

Cold-Rolling. The Influence of Cold Rolling on the Physical Properties of Copper, F. Johnson. Metal Industry (Lond.), vol. 16, no. 16, April 16, 1920, pp. 307-314, 7 figs. Also in Engineering, vol. 110, no. 2851, Aug. 20, 1920, pp. 257-260, 9 figs. Tensile, elongation and scleroscope tests on strip-copper specimens, showed that tenacity and hardness increased by application of cold work, except at certain stages where over certain ranges they remained constant. Over these ranges specific gravity either decreased or remains constant and elastic limit increases. Paper read before Inst. of Metals.

Corrosion. Corrosion of Copper, G. F. Bengough and O. F. Hudson. Metal Industry (London), vol. 14, nos. 21 and 24, May 23 and June 13, 1919, pp. 425-427, 1 fig., 489-490, 1 fig. Action of distilled water on oxide free copper surfaces. From fourth report of Corrosion Committee of Inst. of Metals.

Deposits. See COPPER DEPOSITS.

Diffusion in Liquid Aluminum. Diffusion of Solid Copper in Liquid Aluminum, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 12, Sept. 22, 1920, pp. 575-577, 7 figs. Details of experiments where copper rods were dipped in molten aluminum under definite conditions, and resulting alloy analyzed. Filiation experiments also were made in various ways, all giving nearly same results.

Dissolution in Aqueous Ammonia. On the Rate of Dissolution of Metallic Copper in Aqueous Ammonia, I. Eiichi Yamasaki. Sci. Reports, Tôhoku Imperial University, vol. 9, no. 3, June 1920, pp. 170-220, 7 figs. Description of experiment, including rates of dissolution in pure aqueous ammonia and in presence of ammonium salts; effects of various conditions of experiment and of various substances; mathematical representation of the experiment and theoretical explanation of it, etc.

Electrodeposition of. See ELECTROPLATING, Copper.

Exports and Imports. See IRON, Export and Imports.

Extruded Rods. Extruding Brass and Copper Rods, Edward K. Hammond. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 1-4, 7 figs. Methods and equipment employed by Rome Brass & Copper Co., Rome, New York, in production of brass and copper rods by extrusion process.

See also BRASS, Extrusion of.

Firebox, Standardization of. The Standardization of Copper (Ueber die Normalisierung von Kupfer), O. Nielsen. Metall u. Erz, vol. 17, no. 1, Jan. 8, 1920, pp. 4-10. Table is included giving regulations for firebox copper in various countries of North and South America and Europe, and table of regulations for material in German Navy.

Hardness. Ball Hardness of Copper and Hardened Brasses (La Dureté à la Bille du cuivre et des laitons écrouis), A. Portevin. Revue de Métallurgie, vol. 16, no. 4; July-Aug. 1919, pp. 235-238, 3 figs. Experiments to examine to what extent ball hardness determined by this method was related to other mechanical properties of metals.

Hydrogen, Effect on. Some Notes on the Effects of Hydrogen on Copper, W. C. Hothersall and E. L. Rhead. Metal Industry (Lond.), vol. 16, no. 15, April 9, 1920, pp. 293-296, 8 figs. Also in Engineering, vol. 109, no. 2829, Mar. 19, 1920, pp. 391-392, 8 figs. Experimental investigation of effect produced by passage of hydrogen through molten copper on properties of copper when cast. General conclusion is formed that copper treated in molten state with hydrogen will, under suitable conditions, cast sound, while copper which has not been treated with hydrogen but has been deoxidized by carbon will not cast sound under same conditions of casting; but copper treated with hydrogen is liable to pipe badly on casting unless comparatively large amount of arsenic is present. Paper read before Inst. of Metals.

Metallurgy. See COPPER METALLURGY.

Mines. See COPPER MINES.

Mining. See COPPER MINING.

Molten, Physical Properties. Determination of the Cubic Expansion and the Specific Weight of Molten Copper and the Effect of Gas Absorption on the Contraction of Cast Copper (Ermittlung der kubischen Ausdehnung und des spezifischen Gewichts von geschmolzenem Kupfer und Einfluss der Gasabsorption auf die Schwindung des gegossenen Kupfers), W. Stahl. Metall und Erz, vol. 16, no. 19, Oct. 8, 1919, pp. 443-444. Calculation of volume and weight of gas-free, dense and pure copper.

Ore. See COPPER ORE.

Prices in 1919. See NON-FERROUS METALS, Prices in 1919.

Properties, Determination of. Relationship of Physical and Chemical Properties of Copper, Frank L. Antisell. Min. & Metallurgy, no. 157, section 2, Jan. 1920, 5 pp. Reasons for rejecting refined copper on physical examination are enumerated. Electrical conductivity of copper is considered as most convenient method of determining its general properties.

Reaction with Zinc. Compounds Formed by Reciprocal Penetration of Zinc and Copper at Temperature at Which These Two Metals and All Their Alloys Remain in the Solid State (Les constituants formés par penétration réciproque du zinc et du cuivre à une temperature où ces deux métaux et tous leurs alliages sont à l'état solide), H. Weiss. Comptes rendus des

Séances de l'Académie de Sciences, vol. 171, no. 2, July 12, 1920, pp. 108-111, 2 figs. Compounds formed after heating metals for two days at 400 deg. cent.

Recovery of. Process for Recovery of Metallic Copper from Copper-Plated Iron (Verfahren zur Wiedergewinnung von metallischem Kupfer aus auf Eisen plattiertem Kupfer). Metall-Technik, vol. 45, no. 39-40, Oct. 4, 1919, pp. 155-156. Description of process patented by C. Heckmann Corporation, Duisburg.

Red Coloring of. The Red Coloring of Copper (Rotfärbung von Kupfer). Elektrotechnischer Anzeiger, vol. 36, no. 125, Nov. 5, 1919, pp. 594-595. It is claimed that a very good brilliant red can be obtained by cherry-red heating of the object in question and cooling in hot water, whereas yellow, green, brown, etc., can be obtained by moderate heating and cooling in cold water. Description of certain processes recently patented.

Refined, Requirements of. The Requirements of Refined Copper, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 22, no. 10, Mar. 10, 1920, pp. 449-453, 6 figs. Discussion of market requirements of refined copper as to electrical conductivity, pitch, ductility, casting and dimensions, together with notes as to effect of analysis, manipulation and metallurgical practice on these characteristics.

Salts, Solutions of. See SOLUTIONS, Copper Bromide and Chloride.

Specific Heat. Determination of the Specific Weight of Copper at Melting Heat (Ermittlung der spezifischen Gewichte, die die feurigflüssigen Kupfer in den Schmelzhitzen haben), W. Stahl. Metall u. Erz, vol. 17, no. 4, Feb. 22, 1920, pp. 93-94. Conditions are enumerated which are necessary in making the above-mentioned determination and directions given for attaining such conditions.

Spectrum of. The Spectrum of Copper, W. M. Hicks. Lond., Edinburgh and Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 457-481. Notes on lines in spectrum of copper. Analytical determination of spectral constants.

[See also NON-FERROUS METALS, Specifications.]

COPPER ALLOYS

Commercial Compositions. Copper Alloys, Brasses and Bronzes, H. L. Reason. Managing Eng., vol. 6, no. 9, Jan. 1920, pp. 212-218, 18 figs. Specifications for various commercial compositions, specially such patented alloys as delta metal, together with curves giving physical characteristics of copper alloys.

Copper-Aluminum. Experience with a 91:9 Copper-Aluminum Alloy, A. I. Krynitzky. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 770-771, 6 figs. It was concluded by comparison with alloys containing 10 per cent or more of aluminum that proportion of aluminum above 9 per cent is not advisable.

Copper-Antimony. Expansion of Copper-Antimony Alloys (Sur la dilatation des alliages cuivre-antimoine), Paul Braesco. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 103-105, 2 figs. Experimental measurement of coefficient of expansion of tempered and preheated samples of different compositions of copper-antimony alloys at temperatures between 100 and 300 deg. cent.

Copper-Calcium. The Production of Copper Calcium Alloys, Friedrich O. Bensel. Metal Industry (N. Y.), vol. 18, no. 6, June 1920, p. 277. Most favorable process economically, it is shown, is represented by the cuprous chloride and calcium chloride in an electrolyte of fluorspar and calcium chloride. Translated from Metal und Erz (2, 1914, p. 16).

Copper-Silicon. Copper Silicon Alloys (Sur les alliages cuivre-silicium), A. Sanfourche. Revue de Métallurgie, vol. 16, no. 4, July-Aug. 1919, pp. 246-256, 1 fig. Formation, composition, methods of analysis and diagram of state.

The Alloys of Copper and Silicon, A. Sanfourche. Foundry Trade Jl., vol. 22, no. 217, Jan. 1920, pp. 52-53, 1 fig. Maximum in liquidus curve is interpreted to have composition Cu_{13} Si_4 and Y crystals to be definite compounds of composition Cu_{19} Si_4. Translated from Revue de Métallurgie.

Nickel-Copper. See NICKEL ALLOYS, Copper-Nickel.

Phosphor-Copper. Fifteen Per Cent. Phosphor-Copper—New Process for Making, P. E. Demmler. Min. & Metallurgy, no. 162, June 1920, pp. 32-33. Uniform product is obtained, it is said, by passing phosphorus vapor over copper heated to temperature of 400 deg. cent.

New Process for Making Fifteen Per Cent Phosphor-Copper, P. E. Demmler. Metal Industry (New York), vol. 18, no. 7, July 1920, pp. 314-315, 1 fig. Gives particulars of experiments of authors showing that a uniform 15 per cent phosphor-copper can be produced by passing phosphorus vapor over heated copper, and that most satisfactory temperature of copper is 400 deg. cent. Paper to be presented in Oct. before Inst. Metals Division of Am. Inst. Min. & Met. Engrs.

Zinc-Aluminum-Copper. See ZINC ALLOYS, Zinc-Aluminum-Copper.

[See also ALUMINUM ALLOYS, Al-Mg-Cu.]

COPPER DEPOSITS

Jerome, Ariz. Geology and Ore Deposits of Jerome District, Louis E. Reber. Min. & Metallurgy, no. 161, May 1920, pp. 25-27. Notes on copper deposits of Jerome district of north central Arizona, which ranks sixth among copper camps of United States.

Meteorite Vein. Metallic Copper in a Meteorite Vein, T. T. Quirke. Economic Geology, vol. 14, no. 8, Dec. 1919, pp. 619-624, 3 figs. Examination is said to have developed that meteorite which fell on June 30, 1918, near Richardton, N. D., contained metalliferous veins of iron sulphide, metallic iron, nickel and copper along fractures, which were epigenetic to stony constituents of meteorite.

COPPER METALLURGY

Blast-Furnace Charging. The Economics of Copper Blast Furnace Charging, C. A. Grabill, Eng. & Min. Jl., vol. 110, no. 11, Sept. 11, 1920, pp. 510-514, 6 figs. Claims that analyses should not alone be considered, but method of calculating costs is of great importance, and graphs, as for slag losses, plotted from experimental data, are almost indispensable. Degree of sulphur oxidation and how it may be varied.

Dust Exhaust for Smelter. See DUST, Exhaust System for.

Electrolytic Assaying. The Electrolytic Copper Assay—A New Modification, F. G. Hawley. Eng. and Min. Jl., vol. 110, no. 4, July 24, 1920, pp. 162-165. Proposed method claimed to be of special advantage in the presence of impurities such as arsenic, antimony, bismuth, selenium, and molybdenum.

Electrolytic Determination. The Electrolytic Determination of Copper in Raw and Calcined Pyrites. (Ueber die elektrolytische Bestimmung des Kupfers in Schwefelkiesch und Kiesabbränden), Ernst Mengler. Chemiker-Zeitung, vol. 43, no. 129, Oct. 25, 1919, p. 729. Account

of method employed for 25 years in a Duisburg copper foundry.

Electrolytic Refining. See Refining.

Electrolytic Separation. Electrolytic Separation of Copper from a Copper-Cobalt-Nickel Matte, R. G. Knickerbocker. Min. and Sci. Press, vol. 121, no. 2, July 10, 1920, pp. 45-50, 6 figs. Discussion of quality of products delivered to copper department; the leaching plant; the electrolytic plant; and the furnace-refinery. Writer believes metallurgical method is available for profitable treatment of ore.

Extraction. Notes on the War Extraction of Copper, D. W. Jones. Jl. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 365T-367T. Concerning grinding, calcining in hand furnaces and leaching in wooden tanks.

Flotation. See FLOTATION, Low-Grade Copper Ores.

Leaching. Leaching and Concentrating Mixed Copper Ores, Arthur Crowfoot and Kenneth H. Donaldson. Eng. & Min. Jl., vol. 110, no. 10, Sept. 4, 1920, pp. 471-474, 5 figs. Method used at experimental plant of Arizona Copper Co., which consists in regrinding, dissolution of oxidized copper in weak sulphuric acid and flotation of sulphide slimes.

Mill Design. Technical Operations on the Suan Concession, Korea, A. R. Weigall and J. F. Mitchell-Roberts. Min. & Sci. Press, vol. 119, no. 23, Dec. 6, 1919, pp. 805-815, 4 figs. Design and equipment of copper mill having capacity of 14,000 tons per month.

Production from Secondary Material. Production of Copper from Secondary Material, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 119-122, 1 fig. Methods of sampling miscellaneous products entering refinery, their treatment in regular or special furnaces with discussion of commercial possibility of recovering some of impurities as metallic by-products.

Refining. Elements of Design of a Copper Refinery, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 23, no. 5, Aug. 4, 1920, pp. 193-196, 3 figs. Two general principles are laid down: (1) that all impurities possible should be eliminated at anode furnaces, using basic furnaces if necessary; and (2) that anodes of constant composition, uniform current density and single electrolyte should be used throughout tank house.

The Application of Copper-Refining Practice to Other Fields, Lawrence Addicks. Chem. and Metallurgical Eng., vol. 23, no. 3, July 21, 1920, pp. 110-112. Discusses the application of electrolysis to refining of other metals than copper.

The Power Problem in a Copper Refinery, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, pp. 275-278, 4 figs. Outline of steam recovery possible with waste-heat boilers and steam demand for heating electrolyte, with discussion of bearing of these factors upon problem of choice of prime mover.

Smelter Slags. Copper and Magnetite in Copper Smelter Slags, Charles G. Maier and G. D. Van Arsdale. Chemical & Metallurgical Eng., vol. 22, nos. 24 and 25, June 16 and 23, 1920, pp. 1101-1107, 30 figs. and 1157-1162, 10 figs. Chemical and microscopic examination of series of representative slags, showing how copper losses occur, relation of magnetite to copper loss, behavior of converter slags in reverberatory furnaces and suggestions for reducing copper slag losses.

Selecting a Slag and Apportioning Slag Losses, C. A. Grabill. Eng. & Min. Jl., vol. 110, no. 12, Sept. 18, 1920, pp. 569-572, 2 figs. Detailed method of calculating slag and matte composition from given charge. Various means of charging for copper loss. Advantages of basing it on iron contents of slag. Second of series of three articles.

Smelters. Copper Smelting and Refining Works. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 116-117. List showing principal copper smelting works of North America, and capacity of each.

See also SMELTERS, Dumping Ladle Skulls; Stock Losses.

Smelting. Reverberatory Copper Smelting in Arizona, Charles F. Mason. Eng. & Min. Jl., vol. 109, no. 19, May 8, 1920, pp. 1070-1071, 4 figs. States that furnaces are no longer made with sloping arches, and that large uptakes and flues are being used.

Smelting with Bituminous Coal. Smelting with Bituminous Coal in Blast-Furnaces, H. C. Robson. Min. and Sci. Press, vol. 121, no. 12, Sept. 18, 1920, pp. 409-412, 1 fig. Practice at Spassky copper mine, Siberia.

Sulphides, Hydrometallurgy of. Future Hydrometallurgy of Copper Sulphides, William E. Greenawalt. Can. Min. Inst. Bul., no. 97, May 1920, pp. 389-406. It is believed that hydrometallurgy offers effective solution to high shipping and refining costs of copper ores and concentrates. Electrolytic extraction plants, it is maintained, may be installed in any unit and successfully operated without admixture of other ore or fluxes.

Test Mills. The Ajo Test Mill, C. A. Mette. Eng. & Min. Jl., vol. 109, no. 24, June 12, 1920, p. 1314, 2 figs. Describes test mill constructed for treatment of the sulphide ores of the New Cornelia Copper Co., and gives table showing average metallurgical results obtained over entire test run.

COPPER MINES

Alaska. The Salt Chuck Palladium-Copper Mine, J. B. Mertie, Jr. Eng. & Min. Jl., vol. 110, no. 1, July 3, 1920, pp. 17-20, 6 figs. Property yielding copper concentrates carries over 3 per cent of palladium per ton. Ore is concentrated by flotation.

Siberia. The Spassky and Atbasar Copper Mines in Siberia, J. Mackintosh Bell. Min. & Sci. Press, vol. 120, nos. 21 and 23, May 22 and June 5, 1920, pp. 765-769 and 825-829, 8 figs. Notes on regional geology and local topography, genesis of ore, and methods of mining and treatment of the Yuspensky and the Djes Kazgan ores.

COPPER MINING

British Columbia. Boundary District, British Columbia, C. M. Campbell. Eng. & Min. Jl., vol. 109, no. 17, April 24, 1920, pp. 968-973, 5 figs. Historic development of mining operations in regions which within 20 years have produced 20,000,000 tons of low-grade copper ores.

Cerro de Pasco, Peru. Mining at Cerro de Pasco, Peru, Myron R. Walker. Eng. & Min. Jl., vol. 109, no. 5, Jan. 31, 1920, pp. 314-318, 5 figs. Mineralized area in Andean Mountains, at altitude of 14,300 ft. Shrinkage, square-set, and cut-and-fill methods employed. Leaching of stockpiles by meteoric and mine waters.

Sampling. Mine-Sampling, William Huff Wagner. Min. & Sci. Press, vol. 120, no. 13, March 27, 1920, pp. 451-453, 4 figs. Sampling practice followed in mining copper ore in Butte district.

Top Slicing. Top Slicing at Miami—Main Ore Body, B. C. Holdorf. Arizona Min. Jl., vol. 3, no. 6, Nov. 1919, pp. 24-26, 3 figs. Ore body

is sliced in sections 250 feet square, 10 feet high, yielding about 50,000 tons. How this is done is illustrated with sketch.

[See also TIME STUDY, Application to Mining Operation.]

COPPER ORE

Arizona. Ore Deposits of Cave Creek District, in Arizona, Alfred Strong Lewis. Eng. & Min. Jl., vol. 110, no. 15, Oct. 9, 1920, pp. 713-716, 3 figs. Characteristics of copper ores of region.

Vertical Extent of Copper Ore Minerals in the Junction Mine, Warren District, Arizona, Graham John Mitchell. Eng. & Min. Jl., vol. 109, no. 26, June 26, 1920, pp. 1411-1412, 2 figs. Both secondary and primary chalcocite are said to occur, the latter only in depth, where it is associated with primary chalcocite and bornite.

German. The Microstructure of Various Copper Ores (Ueber die Mikrostruktur einiger Kupferschiefererze), George Berg. Zeitschrift für praktische Geologie, vol. 27, no. 6, June 1919, pp. 93-95, 6 figs. on supp. plate. Composition of copper ore found in various districts.

Japan. A Contribution to the Knowledge of the Cassiterite Veins of Pneumato-Hydatogenetic or Hydrothermal Origin, Takeo Katō. Jl. College of Sci., Imperial University of Tokyo, vol. 43, no. 5, May 10, 1920, 57 pp., 28 figs. on 7 supp. plates. A study of the copper-tin veins of the Akénobé district in the province of Tajima, Japan.

Lake Superior. The Copper Ores of Lake Superior, J. E. Spurr. Eng. and Min. Jl., vol. 110, no. 8, Aug. 21, 1920, pp. 355-357, 1 fig. Conglomerates and basaltic flows are said to have afforded zones for circulation of powerful ascending mineral-bearing solutions during period of great volcanic activity.

Porphyry. Treatment Tests on Ores of Consolidated Coppermines Co., Robert Linton. Min. & Metallurgy, no. 162, June 1920, pp. 30-31, 1 fig. Tests made on porphyry ores are said to have demonstrated that recovery of 85 per cent can be made from or averaging 1.4 per cent copper, with ratio of concentration of at least 15 into 1, and with concentrates that carry less than 10 per cent moisture.

CORE BOXES

Construction. Core-Box Construction, Joseph Horner. Foundry Trade Jl., vol. 21, no. 213, Sept. 1919, pp. 643-646, 13 figs. Manner of proceeding.

CORE OVENS

Electrically Heated. Experience with Electric Core Baking, Alan D. Dauch. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 168-170, 4 figs. Reduction of baking time, greater uniformity of product, improved washing conditions and decreased labor cost shown in changing from gas to electric ovens.

Tests Conducted of Electrically Heated Core Ovens. Iron Age, vol. 105, no. 3, Jan. 15. 1920, pp. 193-195, 3 figs. Current used and weight of cores baked per kilowatt.

CORONA

Discharge. Corona Discharge, Earle H. Warner with Jacob Kunz. University of Illinois Bul., vol. 16, no. 41, Bul. no. 114, June 9, 1919, 138 pp., 64 figs. Experimental results are said to have shown that any increase in pressure due to corona appears and disappears much more rapidly than when due to heat only, that heat in corona discharge is not prominent factor until many seconds after corona appears, and that theory advanced by Kunz is verified also in relation between current and pressure for constant voltage.

High-Voltage. The High-Voltage Corona in Air, J. B. Whitehead. Proc. Am. Phil. Soc., vol. 59, no. 4, 1920, pp. 245-260, 8 figs. Experimental testing of empirical formulæ for computing losses due to corona discharges. Construction and operation of corona voltmeter for measuring high voltage.

Loss Tests. Some Corona Loss Tests, W. W. Lewis. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 419-426, 12 figs. Results of tests on 150-mile transmission line at potentials up to about 200,000 volts. Comparison is made between measured and calculated losses.

Motion in Discharge Field. Motion of Droplets and Particles in the Field of the Corona Discharge, Richard C. Tolman and Sebastian Karrer. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920, no. 1203-1206, 9 figs. Cottrell electrical precipitation process. Apparatus is described in which electrostatic fields were determined. Four different effects were distinguished, but corona discharge is believed to be largely responsible for action of Cottrell precipitators.

[See also ELECTRIC TRANSMISSION LINES, Voltage Limitations.]

CORONA LAMPS

See LIGHTING, Corona Lamps.

CORROSION

Aluminum. See ALUMINUM, Corrosion.

Boilers. See BOILERS, Corrosion.

Brass. See BRASS, Corrosion.

Copper. See COPPER, Corrosion.

Electrolytic. The Corrosion of Iron in Contact with Other Metals and Alloys (Ueber das Rosten von Eisen in Berührung mit anderen Metallen und Legierungen), O. Bauer. Stahl und Eisen, vol. 40, no. 2, Jan. 8, 1920, pp. 45-52, 3 figs. Writer calls attention to importance of this subject, especially in connection with bridges, harbor structures, ships, steam boilers, water pipes, etc., and describes a process for ascertaining quantitative conditions on which protection from rust depends. Tables are presented showing potential measurements with pure metals, graphite and commercial alloys, and table giving name and chemical composition of commercial alloys employed in potential measurements.

Gas Mains. See GAS MAINS, Corrosion.

Heating Systems. Abatement of Corrosion in Central Heating Systems, F. N. Speller. Dept. Interior, Bur. Mines, Technical paper 236, 1919, 12 pp., 2 figs. Main source of corrosion is traced to dissolved gases brought into heating system either with feed water for boiler or through leaks in return lines under pressure below that of atmosphere.

Iron and Steel. See IRON, Corrosion.

Marine Boilers. See MARINE BOILERS, Corrosion, Prevention of.

Pipe. See PIPE, Corrosion Prevention.

Standpipes. See STANDPIPES, Corrosion.

Tests for. Tests for Relative Corrosion, Bertram Feuer. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920, pp. 1197-1198. Comparative study of various methods.

COSLETTIZING

See RUST PROOFING, Iron and Steel.

COST ACCOUNTING

Drop-Forge Shops. Cost Accounting for the Drop Forge Shop, C. Oliver Wellington. Am. Drop

Forger, vol. 6, no. 6, June 1920, pp. 278-281. Advises drawing up complete records showing efficiency of departments separately. Paper read before Am. Drop Forge Assn.

Economic Requirements. Cost Accounting in the "New Industrial Day," G. Charter Harrison. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 441-444; also vol. 59, no. 1, Jan. 1920, pp. 13-17, 1 fig. Opinion is expressed that accounting profession faces crisis and great responsibility in its relation to industrial production. Also that cost accounting must fulfill its duty in industrial economics and should parallel actual costs and established standards, showing why first varies from latter if such is the case.

Electrical Apparatus. Costing, Reginald Townsend. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 491-495. Discussion of some phases of modern cost finding with particular reference to the manufacture of electrical apparatus.

Engineers and Contractors, System for. Accounts of Engineers and Contractors, C. A. H. Narlan. Jl. of Accountancy, vol. 30, no. 2, Aug. 1920, pp. 81-87. Advises following coördinated cost system which will permit comparison of actual unit costs with estimates prepared by engineer. Suggestions are given for recording charges for labor and overhead.

Enlarged Use of. Trends in Management, W. R. Basset. Factory, vol. 24, no. 11, June 15, 1920, pp. 1905-1907. Deals with enlarging uses of cost accounting.

Fluctuations in Price. Determination of the Influence of Fluctuations in Price of Materials and Labor on the Cost of Production (Bestimmung des Einflusses von Schwankungen der Materialpreise und der Löhne auf die Gestehungskosten), Hugo Baumann. Betrieb, vol. 2, no. 3, July 1920, pp. 316-319, 4 figs. It is shown how, with the aid of formulæ and curves based thereon, the influence of changes in price of material and labor on cost of production and selling price of machines, apparatus, boilers, etc., can be simply and readily determined.

Establishing Prices without Subsequent Calculation (Preisbildung ohne Nachkalkulation), Wilhelm O. Mueller. Betrieb, vol. 2, no. 3, July 1920, pp. 320-323, 6 figs. States that in a period of rapidly changing production costs the results of checking up actual costs are obtained too seldom and too late to be of great value in establishing selling prices, and a method is developed, based on weights of machines and peace-time prices of 1914, increase in cost of material and labor, and overhead costs, by which selling prices can be established.

Representation of the Occurrences in an Accounting System by Line Charts (Darstellung der Vorgänge im Abrechnungswesen durch Leitungspläne), Hans Goerlitz. Betrieb, vol. 2, no. 10, May 1920, pp. 237-243, 11 figs. States that for an intelligible representation of an accounting system it is necessary to represent the occurrences within it, and writer interprets the fluctuations of value as the flow of value currents and develops connecting-line charts accordingly. Gives example of an enterprise with detail series and mass production.

Forms. A Short Cut to Factory Costs, Joseph O'Brien. Factory, vol. 23, no. 6, Dec. 1919, pp. 1308-1310, 3 figs. Forms used by Economy Eng. Co. for telling at any point during manufacture what product is costing.

Foundries. Estimates Should Parallel Cost-Keeping Method. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 930-931, 2 figs. Estimating and cost-accounting system used in foundry of Fox Machine Co.

Foundry Organisation and Costing, Alexander Hayes. Foundry Trade Jl. & Pattern Maker. vol. 22, no. 221, May 1920, pp. 353-359 and (discussion) pp. 359-361. Outlines principles of a system, details of which, it is said, can be simplified or extended according to nature of work being done. Abstract of paper read before Instn. of British Foundrymen.

Standard Foundry Cost System. Foundry, vol. 48, nos. 10 and 11, May 15 and June 1, 1920, pp. 407-413 and 438-442. May 15: Cost-accounting system compiled by C. E. Knoeppel & Co., Inc., New York, for American Foundrymen's Association. June 1: Tables showing methods of keeping monthly accounts and profit-and-loss account, also casting cost sheet.

Ice Manufacture. See ICE MANUFACTURE, Cost Accounting.

Indirect Charges. The Effect of Indirect Charges of Cost, J. Fearn. Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 583-589, 3 figs. Factors that enter into cost of production. Recommendations in regard to manner of distributing charges. Paper presented before Drop Forgers' Assn. of England.

Laboratories. The Value of Cost Accounting in Commercial Laboratories, William W. Caswell. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 79-81. Economical aspect of installing system of cost accounting.

Machine Shops. See MACHINE SHOPS, Overhead Costs.

Man-Hour Rate Basis. The Philadelphia Electric Company Payroll System for Cost Work on Departmental Man-Hour Rate Basis, G. P. Landwehr. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 47-51, 6 figs. Forms used in connection with determination of cost of constructing, operating and maintaining necessary equipment for production of article to be sold.

Overhead, Distribution of. Handling "Overhead"—A Plan That Avoids Red Tape, S. P. Keator. Factory, vol. 24, no. 8, May 1, 1920, pp. 1343-1346. It is said that distribution of overhead costs can be greatly simplified if a method and forms are devised to secure simple and accurate expense reports from the shop. Practice of one plant is explained.

Railway. Cost Accounting—The Key to Cost Control, George W. Armstrong. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 374-379, 12 figs. Discussion on advantages of cost keeping with description of system used by Baltimore and Ohio R. R.

Record Forms. An Improved System of Engineering Costing, G. E. Hitchen. Machy. (Lond.), vol. 15, no. 389, March 11, 1920, pp. 751-756, 14 figs. Forms for recording weekly cost of each job, weekly proportion of labor to materials, exact cost of job and of any desired section of job as soon as completed.

Routing and Cost Keeping. Controlling Production and Keeping Costs in a Broaching Tool Plant, H. R. Simonds. Iron Trade Rev., vol. 66, no. 10, Mar. 4, 1920, pp. 697-702, 16 figs. Plan of routing and cost keeping followed at plant of J. N. Lapointe Co., New London, Conn. Records enable executives to know at once status of job in relation to schedule. Forms used are illustrated.

Handling Plant Appropriations, James J. Zimmerman. Iron Trade Rev., vol. 66, no. 9, Feb. 26, 1920, pp. 634-637, 8 figs. System is outlined for recording construction statistics so that status of any particular work, for which appropriation has been made, can be had at any time.

Scientific Basis for. Scientific Basis for Cost Accounting, G. Charter Harrison. Indus. Management, vol. 59, no. 3, March 1920, pp. 237-

242. Formulæ are given for determining cost variations for different classes of expense.

Shipyards. See SHIP CONSTRUCTION, Costs.

System. Work-Routing and Cost-Accounting System of the Standard Gas Engine Company. Metal Trades, vol. 11, no. 2, Feb. 1920, pp. 82-85, 10 figs. Plant employs about 300 men.

Tools in Stock Room. Cadillac Stock-Room Methods. Machy. (N. Y.), vol. 26, no. 6, Feb. 1920, pp. 501-502, 2 figs. System of cost accounting consists of figuring average price of all tools of given type, which are on hand in stockroom at time each new shipment of tools of that type is received.

Uniform. Uniform Cost Accounting, William R. Basset. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 991-993. Address delivered before Nat. Machine Tool Builders' Assn.

Unit Plan. Unit Cost Accounting for Control, L. V. Estes. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 359-363, 6 figs. Suggests cost accounting plan which combines in one standard units of measure of production and the element of time in such a way that unit cost obtained is cost of effort expended.

[See also INDUSTRIAL MANAGEMENT, Production Control.]

COST SYSTEMS

Forms for. A Cost System that Guides Policies, William R. Bassett and S. R. Gordon. Factory, vol. 24, no. 1, Jan. 1920, pp. 43-48, 7 figs. Forms for charge register, expense analysis, distribution, payroll, etc. Their use in knitting mill is explained.

Foundry. Standard Foundry Cost System. Foundry, vol. 48, no. 12, June 15, 1920, pp. 474-480. Depreciation rates for buildings and equipment.

Requirements for Success. Advantages of Uniformity in Costs, C. E. Knoeppel. Foundry, vol. 48, no. 4, Feb. 15, 1920, pp. 133-135. Writer maintains that an accurate cost system based on uniform plan is only successful when it serves with equal fidelity sales, production and financial departments.

COSTS

Analysis of. A Graphic Method of Cost Analysis, G. I. Vincent. Am. Gas Assn. Monthly, vol. 1, no. 8, Aug. 1919, pp. 431-434, 2 figs. Suggested graphic method is illustrated with graphic studies of boiler fuel cost and boiler house labor cost.

Brass Melting, Electric. See BRASS FOUNDING, Electric Melting Costs.

Building Construction. See BUILDING CONSTRUCTION, Costs.

Concrete Buildings. See CONCRETE CONSTRUCTION, REINFORCED, Cost Estimation.

England. Engineering Costs, Frank Walker. Eng. & Indus. Management, vol. 4, no. 8, Aug. 19, 1920, pp. 227-232, 3 figs. Statement of costs of labor and materials from July 1914 to June 1920, given in official organ of British Elec. & Allied Manufacturers' Assn.

Factory, Checking. Checking the Factory Costs, Wm. A. Smith. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 786-787. Indicates how cost records can be interlocked and checked with financial books.

Foundry. Production Cost and Profit Control in Non-Ferrous Foundries, Walter Glenn Scott. Metal Indus., vol. 15, no. 21, Nov. 21, 1919, pp. 429-431, 1 fig. Suggested method of keeping in touch with cost of a product at any stage of its manufacture.

Price Changes. Quantitative Analysis of All Factors That Affect Average Prices and a Formula for Predicting Price Changes, Halbert P. Gillette. Eng. & Contracting, vol. 53, no. 14, April 7, 1920, pp. 381-402, 6 figs. It is concluded from study of economic situation based on laws of economics and statement of conditions as reported by Department of Labor that "the level of commodity prices and wages will not descend permanently below 1¾ times the pre-war level for many years to come."

Production, Buildings and. Are Your Buildings to Blame for High Production Costs? W. R. Basset and Morgan G. Farrell. Factory, vol. 24, no. 9, May 15, 1920, pp. 1521-1525, 8 figs. It is pointed out that most manufacturing businesses grow gradually and with additions or new buildings here and there, plant develops into haphazard, often ill-arranged group. Writers discuss solutions of this problem.

Steam Power. See STEAM POWER PLANTS, Costs.

Steel Manufacture. See STEEL MANUFACTURE, Costs.

Woodworking Factories. See WOODWORKING INDUSTRY, Costs.

COTTON GINS

Static Electricity in. Static Electrical Hazard in Cotton Gins, E. K. Collett. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 151-152, 1 fig. Suggested specification for grounding of gins to prevent static electricity.

COTTON INDUSTRY

Health Conditions. See HEALTH, Cotton Industry, Improvement in.

Research. Research a Necessity to the Cotton Industry, H. E. Howe. Manufacturers Rec., vol. 76, no. 18, Oct. 30, 1919, pp. 114-115. Urges formation of cotton research association in U. S. A. organized along lines of similar associations established in Great Britain.

COTTON MILLS

Safety in. See TEXTILE MILLS, Safety in.

COTTON OIL INDUSTRY

Details of. Pictorial Description of the Cotton Oil Industry, David Wesson. Chem. & Metallurgical Eng., vol. 22, no. 10, Mar. 10, 1920, pp. 465-473, 64 figs. Comparative statistics of food values and efficiency of refining practice of cotton-seed oil. Photographs in sequence illustrating industry from boll on through gin, oil press, refinery, packaging and shipping departments.

COTTRELL PRECIPITATION PROCESS

See CORONA, Motion in Discharge Field; DUST, Precipitation.

COUPLINGS

Flexible-Clutch. Flexible Clutch Couplings, Charles L. Hubbard. Nat. Engr., vol. 24, no. 1, Jan. 1920, pp. 13-16, 13 figs. To compensate for shafting out of alignment and overcome difficulties in installation and operation. Various types and applications.

CRANES

Breakdown. See Wrecking.

Bridge, Boston Army Base. Bridge Cranes at the Boston Army Base. Int. Mar. Eng., vol. 25, no. 3, March 1920, pp. 221-222, 4 figs. Designed to handle 5000- to 8000-lb. loads.

Bridge Storage. Progress in the Construction of Bridge Storage Cranes at Locomotive Coaling Plants in Austria (Konstruktive Neuerungen an

Greiferkranen bei Lokomotivbekohlungsanlagen in Oesterreich), Vladislav Sykora. Elektrotechnik u. Maschinenbau, vol. 38, no. 9, Feb. 29, 1920, pp. 94-100, 17 figs. Details and illustrations of various new devices and systems with electrical equipment, developed by the Austrian Brown-Boveri Co., the A. E. G. Union Electrical Co., Vienna, etc.

Cargo. Mechanical Method for Handling Cargo, Warren Travell. Shipping, vol. 9, nos. 11 and 12, Dec. 17 and 24, 1919, pp. 23-24 and 68, 2 figs. and 23-24, 2 figs. General design of cargo cranes of types C and D.

Carriage Wheels. Loads on Crane Carriage Wheels, W. W. Padfield. Mech. World, vol. 68, no. 1749, July 9, 1920, pp. 28-29, 4 figs. Method for finding wheel loads when the crane has six rail wheels equally pitched; when crane has eight wheels unequally though symmetrically spaced. Algebraic and graphic treatment of problem.

Design. The Determination of the Loads on Crane Wheels, E. L. Montagnon. Eng., vol. 109, no. 2839, May 28, 1920, pp. 705-707, 6 figs. Method of taking moment is suggested which is said to give same answer for steel loads whether upper and lower portion of cranes are treated separately or combined at their common center of gravity.

Derricks. See Wooden-Jib.

D.-C. Controllers. Direct-Current Crane Controllers, H. D. James. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 380-385, 11 figs. Manual and magnetic types.

Dock. Practical Crane Installations. Mar. Rev., vol. 49, no. 12, Dec. 1919, pp. 592-593. Smaller types of cranes for docks are favored because two can be used simultaneously at one hatch for emergency lifts.

The New Unloading Installations of Port of Bordeaux (Les nouvelles installations de déchargement du port de Bordeaux), Henry Martin. Génie Civil, vol. 77, no. 1, July 3, 1920, pp. 1-8, 18 figs. partly on supp. plate. Details of traveling cranes.

Floating. Floating Crane for Australia. Engr., vol. 130, no. 3366, July 2, 1920, pp. 18-19, 3 figs. Details of 150-ton floating crane for Australian Navy, construction of which differs considerably from that of the large floating cranes built by Dutch and German firms, inasmuch as it includes the type of roller path and centering device embodied in Cowans, Sheldon & Co.'s patent designs, effecting a saving of structural material, convenience in erection, and offering a roller path and rack of comparatively large diameter.

Load Strain-Gage Test of 150-Ton Floating Crane for the Bureau of Yards and Docks U. S. Navy Department, Louis J. Larson and Richard L. Templin. Technologic Papers Bur. Standards, no. 151, March 18, 1920, 84 pp., 27 figs. Arrangements made to take strain-gage measurements on important members of 150-ton revolving, floating crane built for use in navy yard at Norfolk, Va.

The Latest Developments in Floating Cranes (Die neueste Entwicklung des Schwimmkrans), H. Wintermeyer. Schiffbau, vol. 21, no. 15, Mar. 3, 1920, pp. 467-470, 5 figs. Notes on floating cranes with jibs of variable radius, with trolleys on stationary bridges, and with jibs revolving around vertical axis.

250-ton Floating Crane of British Admiralty (Grue flottante de 250 tonnes). Génie Civil, vol. 75, no. 17, Oct. 25, 1919, pp. 389-391, 7 figs., partly on supp. plate.

Ward Leonard Control Applied to Heavy Cranes, H. H. Broughton. Elecn., vol. 85, no. 2208, Sept. 10, 1920, pp. 292-295, 2 figs. Electrical equipment of 250-ton floating cranes designed for service in Panama Canal.

Foundry. Employment of the Electric Drive for a Modern Foundry Crane (Die Anwendung des elektrischen Antriebes bei einem modernen Giesskran), A. Kussler. Elektrotechnische Zeitschrift, vol. 41, no. 17, Apr. 29, 1920, pp. 332-334, 2 figs. Describes a 100-ton crane for a large open-hearth steelworks, constructed by the Augsburg-Nuremburg Machine Works Corp., electrical equipment for which was supplied by the Siemens-Schuckert Works.

Hammerhead. The Largest Fitting-Out Crane in America. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 412-416, 12 figs. Details of 350-ton hammerhead crane erected on fitting-out pier of Loney Island Navy Yard. Overall height of crane is over 245 ft. Its cost above foundations was $875,000.

See also DERRICKS.

Ladle. Main Hoists for Open Hearth Ladle Cranes, W. W. Garrett, Jr. Jl. Assn. Iron & Steel Elec. Engrs., Oct. 1919, pp. 18-22 and (discussion) pp. 22-29. Also in Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 593-594. Tests and observations made on overhead electric traveling cranes, and suggestions in regard to their operation.

Locomotive. See COAL HANDLING, Locomotive Cranes.

Plated Work. The Plated Work of Cranes. Mech. World, vol. 66, nos. 1712 and 1719, Oct. 24 and Dec. 12, 1919, pp. 199-200, 3 figs., and 282, 2 figs. Illustrating girders built up with plates, strips and angles. Method of making joints of parts that are not in same plane.

Pontoon. Mare Island Pontoon Crane of 150-Ton Capacity. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1245-1248, 3 figs. Heavy structural features include 1000-ton step bearing and long luffing screws without intermediate bearing; 305 tons lifting in test.

Rivet Connections, Loosening of. Two Causes for the Loosening of Rivet Connections of Traveling and Revolving Cranes (Zwei Ursachen für das Lockerwerden von Nietanschlüssen bei Lauf- und Drehkranen), R. P. Schröder. Fördertechnik u. Frachtverkehr, vol. 13, no. 2, Jan. 23, 1920, pp. 19-22, 1 fig. Writer endeavors to give a more exact basis for the calculation of stresses in traveling and revolving cranes, and suggests that they be so designed as to avoid occurrences of stresses which have not been sufficiently determined.

Safety Practice for. Consider the Crane, Chester C. Rausch. Wisconsin Engr., vol. 24, no. 2, Nov. 1919, pp. 53-62. Suggestions in regard to installation of cranes with a view to avoid accidents and also locating lights in such a position as never to cause a glaring light confusing vision of crane operator. Paper read before National Safety Congress.

Cranes, Chester C. Rausch. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 150-151. Recommendations in regard to safe practice and safety devices in connection with overhead and locomotive cranes.

Shipyard. A Description of a New Type of Shipyard Crane, W. Hok. Marine Eng., vol. 10, no. 4, Apr. 1920, pp. 84-87, 6 figs. Writer describes a crane used in a Swedish yard and presents a schematic outline of a building yard laid out according to his ideas.

A New Type of Shipyard Crane, W. Hok. Iron & Steel of Canada, vol. 3, no. 5, June 1920, pp. 163-168, 6 figs. Also Shipbuilder, vol. 22, no. 117, May 1920, pp. 321-323, 1 fig. Also in Shipbuilding & Shipping Rec., vol. 15, no. 17, Apr. 22, 1920, pp. 544-546, 3 figs. Stationary building-berth type composed of

stationary main structure and two swinging arms, former consisting of two lattice-work masts placed about 15 ft. 3 in. apart from center to center, and rigidly connected to one another by cross-stays and trusses, making main structure stable in thwartship direction, this obviating necessity of fitting objectionable side-stays. Paper read before Instn. Engrs. & Shipbuilders in Scotland.

Heavy Double Trestle for Shipbuilding Cranes over Newport News Battle-Cruiser Berths, R. W. Burpee. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 723-728, 9 figs. Long runway without expansion joints. 75-ton and 15-ton cranes on same rails. Truss loads divided between tower columns. Transverse framing statistically indeterminate.

Modern Lifting Machinery. Steamship, vol. 31, no. 366, Dec. 1919, pp. 131-135, 7 figs. Cranes built by Herbert Morris, Ltd., Loughborough, England.

New 500-Ton Capacity Crane at Philadelphia Navy Yard. Eng. & Contracting, vol. 53, no. 8, Feb. 25, 1920, pp. 221-223, 1 fig. Description of largest crane of its type in America with a lifting capacity of more than 1,000,000 lb., which has been completed and put in operation at the Navy Yard, Philadelphia.

"Toplis" Horizontal Luffing Cranes for Shipyards. Shipbuilder, vol. 22, no. 116, April 1920, pp. 248-250, 2 figs. Load, while jib is luffed from maximum to minimum radius or vice versa, maintains horizontal path, hoisting rope being led over suitable arrangement of pulleys to obtain this result.

Two Notable Shipyard Cranes. Pacific Mar. Rev., vol. 17, no. 6, June 1920, pp. 91-92, 2 figs. Description and illustrations of cantilever type gantry crane which operates above side launching shipbuilding ways of Long Beach Shipbuilding Co., and a 75-ton outfitting crane of the stiff-leg derrick type at the same yard, both constructed by the Fulton Eng. Co. of Los Angeles.

Slewing Power. Calculating the Slewing Power of Cranes, W. H. Mellor. Machy. (Lond.), vol. 14, no. 359, Aug. 14, 1919, pp. 608-609. Power required to accelerate superstructure and load, power required to overcome friction of moving parts, and power required to overcome resistance of wind.

Steel Works. The Use of Compressed Air For Steel-Works Cranes (Die Verwendung von Druckluft für Hüttenwerkskrane), H. Geitmann. Stahl u. Eisen, vol. 40, no. 14, Apr. 8, 1920, pp. 461-468, 13 figs. In order to overcome disadvantageous features of the purely electric drive and reduce cost of installation in connection with the electric equipment of giant crane installations, writer recommends use of compressed air, simple electropneumatic control apparatus and continuously running motors with mechanical couplings and brakes capable of being switched on and of being regulated.

Traveling. Five-Ton Electric Traveling Crane Moving Structural Steel by Means of Lifting Magnets (Pont roulant électrique de 5 tonnes pour le transport de profilés au moyen d'électroaimants de levage). Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 314-315, 4 figs. partly on supp. plate. Built at Oerlikon Works.

Overhead Traveling Crane with Telescopic Cage. Engr., vol. 130, no. 3368, July 16, 1920, pp. 66-67, 2 figs. Crane is capable of lifting 120 tons and is fitted with electric turning gear at hook to facilitate manipulation of work at press and with releasing gear to prevent damage by overloads produced by action of press on work.

Traveling Crane with Lifting Magnet for the Transportation of Long Rolled Steel Sections (Laufkran mit Lasthebemagneten für den Transport von langen Walzeisen), W. Druey. Schweizerische Bauzeitung, vol. 76, no. 6, Aug. 7, 1920, pp. 64-65, 3 figs. Describes plant constructed by the Oerlikon Machine Works, consisting of a traveling crane of 5000 kg. carrying capacity and 25 m. span; two lifting magnets are suspended from each end of the 10-m. long runway, with which ten or twelve rail sections 15 to 20 m. long can be lifted and transported.

See also Ladle.

Wharf. Cargo Handling at Ports, Brysson Cunningham. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 652-657, 3 figs. Early appliances are alluded to, inception of hydraulic crane is described, and features and requirements of electric quay crane are enumerated.

See also Dock.

Wheel Loads. See Design.

Wooden-Jib. 135-Ft. Wooden Derrick Crane Jib. Eng., vol. 110, no. 2850, Aug. 13, 1920, pp. 206-207, 6 figs. Constructed by Imber Court Engineering Works, Thames Ditton, Surrey, for British Admiralty during war. Working conditions to be fulfilled were that crane with post 50 ft. high was to lift 3-ton load up to platform 100 ft. high. Wooden construction was adopted in preference to steel in order to save weight.

Wrecking. A Railway Breakdown Crane. Ry. Gaz., vol. 32, no. 6, Feb. 6, 1920, pp. 187-188, 1 fig. Type used by Lancashire and Yorkshire Ry., England. It is capable of lifting 35 tons at radius of 17 ft., 30 tons at 20 ft., and 20 tons at 25 ft., with undercarriage blocked up and clipped to rails.

CRANK MOTION

Mechanism. Articulated Mechanism for Transforming Continuous Rotation into an Alternating Translation, One Complete Motion of the Translation Corresponding to Two Revolutions of Crank (Sur un mécanisme articulé pour transformation de rotatif continu en alternatif, avec déduplication), Luc Denis. Vie Technique et Industrielle, vol. 1, no. 10, July 1920, pp. 311-312, 6 figs.

CRANKCASES

Machining Operations. Machining Operations on a Six-Cylinder and Crankcase Block, P. M. Heldt. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 712-716, 12 figs. Practice of casting top half of crankcase integral with cylinder block, first applied in connection with four-cylinder engines, has recently been adopted for six-cylinder construction. Milling and drilling work which has to be done on block in preparation for attachment of other parts is described.

Machining the Liberty Crankcases, H. A. Carhart. Am. Mach., vol. 52, no. 26, June 24, 1920, pp. 1361-1364, 13 figs. Show method used in drilling holes for oil tubes. Crankcase is a "dry" type instead of splash oiling as in general automobile practice. Final reaming of bearings is said to be of special interest.

CRANKPINS

Grinding. See GRINDING MACHINES, Crankpin.

CRANKSHAFTS

Aeroplane-Engine. See AEROPLANE ENGINES, Crankshafts.

Automobile-Engine. See AUTOMOBILE ENGINES, Crankshaft Manufacture.

Balancing. The Balancing of Crank Gearing, Es-

pecially by means of Counterweights (Massenausgleich bei Kurbelgetrieben, insbesondere durch Gegengewichte), Rudolph Bestehorn. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 2, Jan. 10, 1920, pp. 42-45, 6 figs. Causes of vibration of reciprocating engines are enumerated and preventive measures suggested. Special reference is made to action of counterweights rotating with crank, and a method is devised for determining best size for these, having regard to dynamic and static conditions.

Diesel-Engine, Machining. Machining Diesel Engine Crankshafts. Motorship, vol. 5, no. 2, Feb. 1920, pp. 122-123, 3 figs. Method patented by John M. Larsen, N.Y.C., in which operations carried out in drilling, planning and slotting machines are eliminated.

Machining. Crank Shaft Machine on Which Tools Revolve. Can. Machy., vol. 23, no. 26, June 24, 1920, p. 589, 1 fig. Type in which shaft is held stationary while cutting tools are caused to revolve around it, and comprising slide bed 21 ft. 9 in. long, 8 ft. wide and 18 in. deep, accurately planed and faced and having two longitudinal and numerous transverse box girders.

Stresses in. Stresses in Crankshafts, Victor M. Summa. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 240-241, 3 figs. Calculations involved in design of shaft of uniform strength.

Torsional Oscillations. Torsional Oscillations of a Crankshaft, J. Morris. Aeronautics, vol. 17, no. 317, Nov. 13, 1919, pp. 454, 3 figs. Effect on crank shaft of relation between frequencies of torsional oscillations and firing strokes.

CRATING

Automobiles and Trucks. Automotive Export Crating Reduced to Blue Prints, Eugene H. Lederer. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 626-628, 24 figs. Experience of Quartermaster Corps, U. S. Army, in transporting automobile trucks in France.

CREDIT

Equating Value of Credit Instruments. Can the Standard Measure of Value be Improved? Jl. Eng. Inst. of Canada, vol. 2, no. 11, Nov. 1919, pp. 720-727. Urges enacting and suggests draft of act "for equating of the value of letters of credit and promises to pay, which change in value on account of the fluctuation of the value of the dollar."

CREOSOTE OIL

See PAVEMENTS, WOOD-BLOCK, Creosote Oil for Blocks.

CRIPPLED SOLDIERS

Reëducation. The Re-Education of Soldiers Who Were Seriously Wounded (Die Wiederbeschäftigung der Schwerbeschädigten in gewerblichen und landwirtschaftlichen Betriemen), Konrad Hartmann. Verhandlungen des Vereins zur Beförderung des Gewerbefleisses, no. 4, June 1919, pp. 155-185, 38 figs. Showing machine tools which can be operated by soldiers and seats especially adapted for those suffering from loss of leg.

CRIPPLES

Reëducation of. Minnesota Plan for the Reeducation and Placement of Cripples, Oscar M. Sullivan. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 184-189. Act follows plan of Mass. act, but authority is placed under State Board for Vocational Education instead of industrial accident commission and scope includes all cripples.

Training of. See DISABLED MEN, Training of. [See also ARTIFICIAL LIMBS.]

CRITICAL SPEED

See STEAM TURBINES, Critical Speeds.

CRUCIBLES

Clays for. Properties of American Bond Clays and Their Use in Graphite Crucibles and Glass Pots. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 144, Jan. 28, 1920, 52 pp., 24 figs. Physical properties of three typical German clays formerly imported in large quantities are given on basis of constants which permit comparison and evaluation of American materials. Physical characteristics of 23 American and 2 English bond clays are determined.

Graphite. The Correct Method of Storing, Annealing, and Handling Plumbago or Graphite Crucibles for Metal Casting, Alfred Phipps. Metal Industry (London), vol. 14, no. 24, June 13, 1919, pp. 481-482. Crucibles to which reference is made are those used for casting brass, gun-metal, phosphor bronze, nickel, malleable iron, steel, aluminium and various alloys.

[See also ZINC METALLURGY, Crucibles.]

CRUISERS

See WARSHIPS, Cruisers.

CRUSHERS

Installation of. Big Crushers at Plumb Run Works, William B. Eastwood. Cement, Mill & Quarry, vol. 15, no. 9, Nov. 5, 1919, pp. 21-25, 6 figs. Installation consists of one 36 x 60-in. Fairmount crusher, one number 8-K crusher, two number 5-K crushers, and two 4-K crushers. The Hornet Crushing Plant, Lloyd C. White. Min. & Sci. Press, vol. 119, no. 18, Nov. 1, 1919, pp. 638-639, 2 figs. Methods of preparing pyritic ore for market.

CRYPTOMETER

See PAINTS, White, Hiding Power of.

CRYSTALLIZATION

Rhythmic. Rhythmic Crystallization, Raphael Ed. Liesegang. Sci. Am. Supp., vol. 88, p. no. 2287, Nov. 22, 1919, pp. 299. Examples of intermittent precipitation. Translated from Die Naturwissenschaffen.

CRYSTALS

Alpha Rays and. Can Influence of the Crystal Structure on the Alpha Rays Be Proved? (Lässt sich ein Einfluss der Kristallstruktur auf a-Strahlen nachweisen?), Karl Heil. Annalen der Physik, vol. 61, no. 2, Jan. 15, 1920, pp. 201-220, 8 figs. Results of photographic and electrometric methods of investigation are said to show that alpha rays find the least resistance in the direction of the elasticity axes; and the influence of the crystal structure appears to be very slight, due doubtless to fact that the a-particles, because of their relatively large volume and velocity, cause partial destructions in crystal. Report from Physical Inst. of Freiburg.

Arrangement of Atoms. The Arrangement of Atoms in Crystals, W. Lawrence Bragg. London, Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, no. 236, Aug. 1920, pp. 169-189, 3 figs. Relation determining distance between neighboring atoms in crystal is worked out. Distance between centres of two atoms is expressed as sum of two constants characteristic of atoms. Physical significance of relation is examined with reference to Langmuir's theory of atomic structure.

Axes of Symmetry, Determination of. Determination of the Axes of Symmetry of a Cubic Crystal (Determination des axes de symétrie d'un cristal cubique), M. F. Canac. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 5, Feb. 2, 1920, pp. 276-278, 7 figs. Schematic study of distribution of reticular planes around axis of symmetry.

Cleavage and Molten Temperature. The Influence of Crystal Cleavage on the Melting Temperature (Ueber den Einfluss der Zerteilung auf die Schmelztemperatur), F. Meissner. Zeitschrift für anorganische u. allgemeine Chemie, vol. 110, no. 3, Mar. 12, 1920, pp. 169-186, 6 figs. Derivation of an equation between surface work and melting temperature of a crystal; determination of the melting temperature of a crystal lamella independent of its thickness.

Drawing. Practical Crystal Drawing, Mary W. Porter. Am. Mineralogist, vol. 5, no. 5, May 1920, pp. 89-95, 21 figs. Describes great simplicity of construction and rapidity of execution of crystal drawings resulting from ingenious application of gnomonic projection of Prof. Goldschmidt. New method of drawing is said to be one of the most valuable aids to practical crystallography that has yet been devised.

Hematite, Magnetization of. Magnetization and Hysteresis in Hematite Crystals, T. Townsend Smith. Physical Rev., vol. 15, no. 5, May 1920, pp. 345-364, 12 figs. Results obtained by measuring the couple exerted when a hematite sphere is suspended in a uniform magnetic field. It is shown that normal magnetization curve of hematite consists of a sharp rise followed by a slow increase, which is proportional to field strength.

Orientation of Layers. Orientation of Layers and Reticular Planes of Crystals (Determination de l'orientation des rangées et des plans reticulaires d'un cristal), F. Canac. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 113-116, 1 fig. Method in which beam of white light of X-rays is sent through crystal at angle of inclination with row under examination. Reticular planes through row give reflected rays characteristically distributed.

Size, Effect of Supersaturation on. Supersaturation and Crystal Size, Wilder D. Bancroft. Jl. Physical Chem., vol. 24, no. 2, Feb. 1920, pp. 100-107. It is alleged that theory of Von Weimarn as to relation between degree of supersaturation and size of crystal is inadequate because it does not take into account number of nuclei formed.

Sodium Chlorate. Observations and Measurements of Optically Active Crystals ($NaClO_3$), (Nuove osservazioni e misure su cristalli otticamente attivi ($NaClO_3$), Eligio Perucca. Il Nuovo Cimento, vol. 18, no. 6, Sept. 1919, pp. 112-154, 20 figs. Polarymetric measurements and measurements of rotating power.

Structure. The Valency Forces in the Structure of Crystals (Die Valenzkräfte im Aufbau der Kristalle). Hans Thirring. Zeitschrift für Elektrochemie, vol. 26, no. 13-14, July 1920, pp. 281-286. Points out that the main achievement of the Born theory lies in fact that from the two described simple assumptions concerning the valency forces in crystals without more specific hypotheses, a number of important thermochemical quantities can be calculated concerning the electron path in the atom. Address before German Bunsen Soc. for Applied Physical Chem.

X-Rays and. Determination of the Parameters of a Crystal by Means of X-Rays (Détermination des paramètres d'un cristal par les rayons X), F. Canac. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 7, Feb. 16, 1920, pp. 394-396. Shows that when rays are sent parallel to axis of symmetry of crystal, the reflected rays arrange themselves in cone having axis of symmetry for axis and for generatrix the incident ray prolonged.

X-Rays and Crystals (Rayons X et cristaux), F. Canac. Le Radium, vol. 11, no. 10, Sept.-Oct. 1919, pp. 305-312. Mathematical study of spectrum given by substance submitted to cathodic bombardment. Formulæ for computing relations connecting wave-length, absorption, weight and atomic number.

See also SPECTROMETERS, Bragg.

CULVERTS

Concrete. Novel Concrete Culvert Business Grows. Concrete, vol. 17, no. 1, July 1920, pp. 24-25, 7 figs. Describes concrete culvert pipe developed by Nelson Concrete Culvert Co., Inc., of Pontiac, Ill. Pipe is used primarily for highway culverts, offering U-shaped sectional units placed on a monolithic base when the culvert is built in the field, in various sizes from 9 by 9 to 36 by 36 in.

Design. The Design of Drainage Structures and Bridges, G. G. Wickline. Good Roads, vol. 19, no. 18, May 5, 1920, pp. 231-232 and 240. Discussion of main points with reference to determination of size, selection of types of structure, and location and design of various short-span highway structures. From paper presented at Texas Roadbuilders' Assn.

Galvanized. Galvanized Culverts, L. G. Carmick. Public Roads, vol. 3, no. 25, May 1920, pp. 26-29, 1 fig. Results obtained by analysis of samples of galvanized culvert sheets.

Wing-Wall. Unique Design of Reinforced Concrete Wing Walls. Ry. Age, vol. 68, no. 16, Apr. 16, 1920, pp. 1207-1209. Application of cantilever principle is said to effect appreciable economy in L. & N. structures. Skew undercrossing, highway underpass, skew railway and wings for 9-ft. by 8-ft. culvert, are described.

[See also CONCRETE, Disintegration by Vacuum.]

CUPOLAS

Blowers. Modern Two-Cupola Foundry at North Tonawanda. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1042-1043, 1 fig. Cupola blower has double use, including removal of gases and smoke, in new Pierce-Brown plant.

British Practice. British Cupola Practice Outlined, R. R. McGowan. Foundry, vol. 48, no. 9, May 1, 1920, pp. 360-361. Among differences from American practice pointed out are stationary bottom and use of limestone and fluorspar.

Charging. Adapting a Skip Hoist to the Cupola. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 6-10, 6 figs. States that skip hoist proved satisfactory in handling cupola charge.

Charging the Cupola and Soaking the Iron, W. W. Ellis. Can. Foundryman, vol. 11, no. 5, May 1920, pp. 128-129. Writer observes that the sooner iron is melted and taken from cupola the less sulphur it will absorb.

Chemical Reactions. Chemical Reactions in the Cupola, Richard Moldenke. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 591-592. Height of fuel bed determines whether all available heat is secured from the fuel. Air volume instead of air pressure should be measured. Low bed causes oxidized iron.

Combustion Process in. Combustion Process in a Foundry Cupola and the Predetermination of

Gas Composition (Der Verbrennungsvorgang im Giessereischachtofen (Kupolofen) und die Voraus bestimmung der Zusammensetzung der Gichtgase), Bernard Osann. Giesserei Zeitung, vol. 16, no. 15, Aug. 1, 1919, pp. 225-230, 3 figs. Writer seeks to demonstrate that when gas is composed of a large quantity of carbon monoxide and small quantity of carbon dioxide, absolute amount of carbon burned to carbon dioxide is not diminished.

Design. Cupola Designed to Save Time and Labor. Iron Age, vol. 105, no. 24, June 10, 1920, pp. 1647-1649, 6 figs. Bottom doors operated by one man. Container receives material direct when bottom is dropped. Clean metal and continuous operation are said to be attained.

Electric Furnaces and. See also ELECTRIC FURNACES, Iron Foundry.

Fuel Economy in. Fuel Economy in Cupola Practice, H. James Yates. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 396. Methods of reducing heat losses due to (1) radiation, (2) sensible heat in waste gases, (3) undeveloped heat in unburned carbonic oxide. Paper read before Iron and Steel Inst.

Practice. Breaking-Up Large Feeder Heads for Re-Melting. Foundry Trade Jl., vol. 22, no. 225, Sept. 1920, p. 692. Description of method adopted by Glenfield & Kennedy, Ltd., Kilmarnock, in their works for breaking up large and bulky scrap into a form suitable for remelting in the cupola.

Cupola Practice is not Consistent, Pat Dwyer. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 671-678, 11 figs. Representative reports on cupolas 24 to 28 inches inside diameter. It is advised that coke ratio be cut down.

Notes on Cupola Practice, J. Bagley. Mech. World, vol. 66, no. 1713, Oct. 31, 1919, pp. 209. Cupola calculations and formulæ expressing reactions. Paper read before Lancashire Branch of British Foundrymen's Assn.

Tuyere, Position of. Ancient and Modern Cupolas (Les cubilots anciens et modernes), T. Levoz. Fonderie Moderne, vol. 12, nos. 6 and 7, June and July, 1919, pp. 126-132 and 153-160, 16 figs. Practice at plant in Milan, Italy. Significance of positions of tuyere.

[See also ELECTRIC FURNACES, Iron Foundry.]

CURRENT MOTORS

Feathering-Paddle. Floating Hydraulic Wheel with Feathering Paddles (Rueda flotante de paletas móviles), F. A. Soldano. Contribución al Estudio de las Ciencias físicas y matematicas, Universidad nacional de la Plata, vol. 1, no. 7, Nov. 1918, pp. 499-509, 7 figs. Hydraulic wheel installed at Coronda, Argentina, for raising river water a height of 40 ft. for irrigation. Water is operated by kinetic energy of current of river. Paddles are composed of two folding panels which open gradually as they enter the water, receiving complete impact of current when fully submerged.

[See also IRRIGATION, Current Motors for.]

CURVES

Exponential, Resolution of. The Resolution of a Curve into a Number of Exponential Components, John W. T. Walsh. Phys. Soc. of London, vol. 32, part 1, Dec. 15, 1919, pp. 26-30. Method for resolution of curve of compound exponential form into its components, values of coefficient and exponent for different exponential terms being found from values of function which are equidistant along one of axes.

Railway. See RAILWAY TRACK, Curve Computation.

CUTTING METALS

Barth Slide Rules for Metal-Cutting Tools. Supplement to Frederick W. Taylor's "On the Art of Cutting Metals," Carl G. Barth. Indus. Management, vol. 58, nos. 5 (Nov. 1919, p. 369) and 6, vol. 59, nos. 2 (Jan. 1920, p. 49) 3, 5 and 6, and vol. 60, nos. 1 (July 1920, p. 49) and 3. Serial, illustrated. Formulæ for cutting metals and general formula for plotting slide rules; also method used in laying out machine tool slide rule to embody all of variables in general formula. Construction of compound planer slide rule and lathe slide rule for cutting steel. Lathe slide rule for cutting steel; slide rules for cutting cast iron; planer slide rule to solve problems dealing with feeds and speeds; slide rules for shapers and slotters; slide rule to give ratio of feed per tooth of milling cutter to thickness of undistorted shaving or chip removed; and slide rules for milling and gear cutting.

City Gas vs. Acetylene. City Gas vs. Acetylene or Hydrocarbon for Cutting Steel, Letson Balliet. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 393-396, 1 fig. Reports of experiments of various investigators prove, it is claimed, that acetylene produces best and most efficient results.

Lathe Tools, Cutting Power of. Cutting Power of Lathe Turning Tools, George W. Burley. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 867-875, 25 figs. It is concluded from experiments that there is no practical cutting speed in which it is impossible to obtain satisfactory surface on plain carbon steels by means of ordinary lathe finishing tools, whether these be made of plain carbon tool steel, ordinary non-vanadium high-speed steel or vanadium high-speed steel. It is added that there is a maximum limiting speed at or above which satisfactory finish cannot be obtained on account of tendency of tool to pluck at and tear surface, this tendency being related to phenomenon of building up on cutting edge of tool. Paper read before Inst. Mech. Engrs.

Oxygen. Gas Cutting, Fred E. Rogers. Welding Engr., vol. 5, no. 5, May 1920, pp. 23-25, 4 figs. Description of the cutting torch and supplies and apparatus required for cutting, metals cut with torch and uses for gas cutting. Defects in cutting are said to be wide kerf, ragged edges caused by poor quality oxygen and unsteady holding of torch, and underhanging and overhanging edges.

Rivet Removal. Process for Removing Rivets and Cutting Metals. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, p. 224. Recent invention by Société Anonyme L'Acetylene D'ssous. Process consists essentially in fusing head of rivet by electric arc of suitable intensity enabling metal of rivet head to combine with substances adapted to form therewith compounds which are sufficiently fusible and liquid at working temperature to flow readily or be blown away by wind of arc.

[See also ELECTRIC WELDING, ARC, Carbon Arc; OXYGEN CUTTING; OXY-ACETYLENE CUTTING.]

CUTTING TOOLS

Formed, Formulas for. Formulas for Formed Tools, W. E. Thompson. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 424-428, 8 figs. Also Machy. (Lond.), vol. 15, no. 381, Jan. 15, 1920, pp. 493-495, 8 figs. Angular position of tools used for planing formed tools. Calculations for making circular tools used on automatic screw machines.

Lathe and Planer Tools. Production of Lathe and Planer Tools, E. G. Blake. Ry. Mech. Engr.,

vol. 94, no. 6, June 1920, pp. 384-385, 2 figs. It is claimed that grinding from bar stock is economical method of manufacture. Advantages of centralized tool service are pointed out.

Lubricants for. See LUBRICANTS, Cutting Tools.

Stellite. How to Use Stellite, G. L. Kronfeld. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 293-295, 11 figs. Rakes recommended for stellite tools.

[See also CUTTING METALS, Barth Slide Rules for Metal-Cutting Tools; LATHE TOOLS.]

CYANAMIDE

Ammonia from. See AMMONIA, Cyanamide as Source; CYANIDES, Cyanamide as Source of.

Impurities. Inorganic Impurities of Calcium Cyanamide (Anorganische Verunreinigungen des Kalkstickstoffs), Jul. Baumann. Chemiker-Zeitung, vol. 44, no. 43, Apr. 8, 1920, pp. 275-276. Notes on certain impurities originating in basic material (coke and lime) and progressing from the carbide to calcium cyanamide, ammonia and nitric acid, such as sulphur, silicium, etc.

Refining. The Refining of Calcium Cyanamide (Veredelung des Kalkstickstoffes), Jul. Baumann. Chemiker-Zeitung, vol. 44, no. 23, Feb. 21, 1920, pp. 158-159. Writer enumerates certain disadvantageous qualities of calcium cyanamide as compared with other nitrogen fertilizers, and describes simple and inexpensive process for production of ammonium carbonate (NH_4HCO_3) which, he claims, is free of abovementioned disadvantages.

CYANIDE SOLUTIONS

Electrical Precipitation. Electrical Precipitation of Cyanide Solutions, Douglas Lay. Eng. & Min. Jl., vol. 110, no. 2, July 10, 1920, pp. 58-62, 4 figs. States that process is considered worthy of further investigation on account of its simplicity and cheapness; lead cathodes may be shipped as base bullion, or paper cathodes used; solutions must be clear.

CYANIDES

Canada. Canadian Cyanide: Its Manufacture and Utilisation, W. S. Landis. Chem. Age (Lond.), vol. 3, no. 59, July 31, 1920, pp. 127-128. Process involves mixing cyanamide and common salt together and melting mixture in special type of single-phase electric furnace.

Cyanamide as Source of. A New Cyanide, W. S. Landis. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 8, pp. 87-97. Developments of process of transforming cyanamide into cyanide in America.

CYANIDING

Cheap Processes for. Some Aspects of Cheap Cyanide Processes, Herbert Phillipp. Chem. & Metallurgical Eng., vol. 22, no. 7, Feb. 18, 1920, pp. 313-317. Reviews developments made in cyanide synthesis, and improvements made in ferrocyanide process.

Manufacture in Canada. Canadian Cyanide, Its Manufacture and Utilization, W. S. Landis. Can. Min. Inst. Bul., no. 98, June 1920, pp. 495-503. It is set forth that Canada today possesses a cyanide manufacturing industry which within three years has so grown that it is supplying bulk of cyanide consumed in mining and fumigating industries of United States and will shortly lead in Canadian and Mexican fields. Aero brand cyanide is said to be equally as efficient in mill circuit as ordinary 96-98 per cent sodium cyanide, and because of its lower cost its use has resulted in marked economies wherever introduced.

New Type of Cyanide. A New Cyanide, W. S. Landis. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 265-268. Development of process at plant of American Cyanamid Co. is illustrated by quoting that while in 1917 there was produced approximately 2,187,000 lb. equivalent of 100 per cent sodium cyanide, in 1918 this grew to 2,350,000. In 1919, during the seven months the plant operated, it produced at rate of 4,000,000 lb. per year. Account is given of experiments conducted and modifications introduced in design of furnace which resulted in so great an increase of production.

Sensitiveness of Reactions. Sensitiveness of Cyanide Reactions, J. B. Ekeley and Icie C. Macy. Salt Lake Min. Rev., vol. 22, no. 2, Apr. 30, 1920, pp. 30-31. Experiments made to determine delicacy of certain tests for presence of cyanides, notably Prussian Blue test and Shonbein test.

[See also GOLD METALLURGY, Cyaniding; SILVER METALLURGY, Cyanide Plant.]

CYLINDERS

Automobile Engines. Cylinders in the Oakland Shop, Fred H. Colvin. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 571-574, 16 figs. Operations on cylinders of small six-cylinder motor in which cylinder block can be readily handled and for which special tools and fixtures have been designed.

How We Make Automobile Cylinders, Fred H. Colvin. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 123-126, 10 figs. Survey of methods in different shops in United States.

The Essex Cylinder. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 579-580, 5 figs. Machining methods.

The Studebaker Methods of Cylinder Production. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 575-579, 17 figs. Methods of large producer of medium-size six-cylinder motors. Tools and fixtures employed are illustrated.

Engine, Machining Fins on. Machining Fins on Radial Engine Cylinders, S. A. Inscoe. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 427-428, 5 figs. Methods of cutting grooves over bosses.

Impeller Pump, Machining. Machining Impeller Pump Cylinders. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 330-331, 5 figs. Also Machy. (Lond.), vol. 15, no. 383, Jan. 29, 1920, pp. 552-553, 5 figs. Methods employed for facing flanges, drilling and tapping flange holes, and boring cylinder.

Machining. See AUTOMOBILE ENGINES, Cylinders.

Molding Methods. Efficient Rig for Making Cylinders, J. R. Anderson. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 15-16, 4 figs. Suggested design of rig.

Properties as Affected by Stresses. Effect of Pressure and Elongation on Physical Properties of Cylinders (Die Einwirkung des Press-und Ziehverfahrens auf die physikalischen Eigenschaften von zylindrischen Hohlkörpern), Reinh. Kühnel. Stahl und Eisen, vol. 39, no. 51, Dec. 18, 1919, pp. 1590-1594, 4 figs. Tests made on cylinders having walls 8 mm., 14 mm. and 20 mm. thick.

Steel, Stresses During Tempering. Method of Determining Tensions in a Circular Cylinder (Méthode de determination des tensions existant dans un cylindre circulaire), M. Mesnager.

Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1391-1393. Suggested procedure for determining stresses developed in steel cylinder during tempering.

Tractor, Machining. Machining Cylinders for the Fordson Tractor, Fred H. Colvin. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 269-273, 15 figs. Types of continuous milling machines used.

Manufacture of Cylinders for "Caterpillar" Tractors. Metal Trades, vol. 10, no. 11, Nov. 1919, pp. 513-514, 2 figs. Composition of steel used.

D

DAIRIES

Mechanical Equipment. Mechanical Equipment of a Modern Dairy, W. F. Sutherland. Power House, vol. 12, no. 17, Oct. 20, 1919, pp. 457-463, 12 figs. Plant for refrigeration purposes and steam generation for pasteurizing.

DAMASCENING

See METALS, Damascening.

DAMS

Arched. Arched Dams, B. A. Smith. Proc. Am. Soc. Civil Engrs., vol. 46, no. 3, Mar. 1920, pp. 375-425, 12 figs. Solution of arch-dam analysis is offered with a view to avoiding defect of ordinary cylinder theory. Defects claimed for latter are that, by it, arch thrust is maximum at base of dam, and that it vanishes at crest. Two cases are dealt with: (1) Complete cylindrical dam or tank of uniform thickness throughout, and (2) complete cylindrical dam or tank of uniformly varying thickness from crest to base.

Concrete Arch Dam Built from Superposed Trestle. Eng. News-Rec., vol. 84, no. 9, Feb. 26, 1920, pp. 421-422, 3 figs. Frame work was erected complete before starting dam. Concrete was elevated to cars on top and dropped through chutes.

Design Details and Field Methods on Thin Arch Dam. Eng. News-Rec., vol. 84, no. 10, March 4, 1920, pp. 474-476, 7 figs. Straddling trestle method of construction used on Warm Springs concrete dam in Oregon.

The Reinforced Concrete Arch Dam, F. A. Noetzli. Jl. of Elec., vol. 45, no. 2, July 15, 1920, pp. 79-80. Technical details of arch dam of fairly slender cross section recently completed in Sweden.

Artificial Lakes. Evolution of Dam Construction for Artificial Lakes (L'évolution des grandes digues pour lacs artificiels), M. Luigi Luiggi. Annales des Ponts et Chassées, vol. 55, no. 2, March-April 1920, pp. 232-268, 19 figs. Comparative study of ancient and modern designs. For heights up to 90 ft. earth embankment with drainage aqueduct of Ambursen type is preferred; from 90 ft. to 180 ft. masonry dams are advised, specially multiple-arch dams for greater heights; for heights from 180 ft. to 300 ft. and in exceptional cases when expense is secondary element, masonry gravity dams are considered the safest. Paper read before Société des Ingénieurs et Architectes italiens.

Bear-Trap. Hydraulic-Fill Dams (Barrages hydrauliques). Houille Blanche, vol. 19, nos. 39-40 and 41-42, March-Apr. and May-June 1920, pp. 41-44 and 81-85, 24 figs. March-Apr.: Hubert and Lutz improved bear-trap type. May-June: Particulars of various structures.

Big Eddy. See Gravity.

Concrete. Big Eddy Storage Dam. Public Works, vol. 48, nos. 14 and 23, Apr. 17 and June 19, 1920, pp. 319-322 and 529-534, 15 figs. Monolithic concrete construction 1100 ft. long and 159 ft. high, with gravity cross-section about 100 ft. wide at base, built in sections in rocky bed of Spanish River, Canada, to serve hydro-electric plants. Attention is directed to special methods of construction necessitated by irregularity of rock bottom which it was necessary first to partially level by submerged drilling, blasting and divers' work before commencing main structure.

Concrete in Water Works Construction, A. C. Irwin. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 225-234, 8 figs. Constructional details of dams, reservoirs, pipe lines, tanks, standpipes, power houses, etc., made of concrete.

Light Concretes and the Height of Dams (Les bétons légers et les records de hauteur des barrages), Charles Rabut. Houille Blanche, vol. 19, nos. 41-42, May-June 1920, pp. 85-87, 2 figs. Formulæ for maximum height of dam in terms of specific gravity and ultimate strength of concrete.

Power Development on Nepisiguit River, James Dick. Can. Engr., vol. 39, no. 13, Sept. 23, 1920, pp. 361-364, 7 figs. Describes reinforced concrete dam and power house in course of construction near Bathurst, N. B.; head, 100 ft.; three vertical units, each 3600 kva.; site for power house excavated in face of 80-ft. cliff at foot of falls.

Simple Plant Makes Good Record in Dam Construction. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 202-203, 1 fig. How favorable location permitted plant with few units to place concrete in 300-ft. dam with small labor force.

The Construction of the Gibraltar Dam, N. A. Bowers. Jl. Electricity, vol. 45, no. 7, Oct. 1, 1920, pp. 325-327, 3 figs. Total height is 185 ft. above bedrock. Radius on center line is 238.5 ft. and width varies from 65 ft. at bottom to 8 ft. at top. Length measured along curve is 1100 ft.

Using 6-in. Bank Run Aggregate on Stevenson Dam. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 638-640, 4 figs. Large size gravel dug by steam shovel from nearby pit and made into concrete chuted into place on Connecticut hydro-electric development.

See also Arched; Construction; Earth.

Construction. The Construction of Earth and Concrete Dams (La construction des barrages en terre et en maçonnerie). Génie Civil, vol. 77, nos. 11 and 12, Sept. 11 and 18, 1920, pp. 205-211 and 230-232, 30 figs. Survey of developments as shown in types recently built in France, Germany, Italy, Australia and United States.

Construction Costs. The Cost and Cubic Content of An Embankment or Dam. Indian Eng., vol. 68, no. 10, Sept. 4, 1920, pp. 137-140. Calculation of cost of cubic content of cutting excavated in cases of dam constructed on (1) surface of parabolic section, (2) inclined plane surface and (3) horizontal plane surface.

Curved. Gravity and Arch Action in Curved Dams, Fred. A. Noetzli. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, pp. 950-951.

Methods for determining for arch dam, proportion of load carried either by gravity, that is, vertical cantilever action, or by horizontal arching. Accuracy of method is believed to compare favorably with that obtained by purely mathematical solution of problem of arched dams.

Detaining. See FLOOD CONTROL, Erie, Pa.

Earth. Building the Earth Dams at the Bridgewater Project, Richard Pfaehler. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 306-309, 5 figs. Three closures of large storage reservoirs built by sluicing earth fill into pool from dumped embankments.

Construction Methods on Three Recent Earth and Concrete Dams, James P. Wells. Eng. & Contracting, vol. 54, no. 6, Aug. 11, 1920, pp. 149-150, 3 figs. Dams are Le Roy Dam and Newark Dam in Western New York and Johnstown dam in Eastern New York. All three are for purpose of impounding water for municipal water supplies. Special attention is directed to methods of making earth fill in each case.

Huffman Dam Outlet. Contracting, vol. 9, Jan. 1, 1920, pp. 243-244, 2 figs. It is stated that structure in Miami Conservancy District, 70 ft. high through earth dam, was built in seven months, 32,450 yd. concrete having been placed in it by two 95-ft. derrick booms.

Hydraulic Fill Dams of the Miami Conservancy District, Harry Gardner. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 11-17, 7 figs. Concerning construction of large earth dams.

Repairs to Pavement of the Belle Fourche Dam, B. E. Hayden. Eng. World, vol. 17, no. 1, July 1920, pp. 11-13, 4 figs. Dam is earthen structure 6200 ft. long on top and 122 ft. high above cut-off trench at maximum section. Method of repair followed consisted of refilling breaches with gravel, relaying disturbed blocks 6 to 8 in. below grade, and finishing with continuous layer of concrete to grade.

See also Construction; Hydraulic-Fill.

Failures. The Record of 100 Dam Failures, Lars Jorgensen. Jl. Electricity, vol. 44, no. 6, March 15, 1920, pp. 274-276, 2 figs. Presented as warning to engineers designing hydroelectric projects involving utilization of natural water powers.

Flood-Control. Concerning Procedure on Miami Flood-Control Dams. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 740-743, 7 figs. How standard products were secured by test control of varying aggregates.

Devil's Gate Dam. Public Works, vol. 49, no. 6, Aug. 7, 1920, pp. 121-122. Flood-control dam, 310 ft. long, 130 ft. high, 2 ft. thick at top and 75 ft. at bottom, constructed, it is said, by only 21 men, thanks to labor-saving machinery and methods.

Flood-Check Dams Formed by Fill behind Wire Frame. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 506-507, 3 figs. New type of California dam automatically fills with flood debris which causes barrier.

Gravity. Building Big Eddy Dam on Spanish River, Ont. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 402-405, 5 figs. Plant layout and construction method used on gravity dam built across valley with narrow gorge requiring caisson cut-off. Work carried on through northern winter.

Dam That Withstood Unusual Service Test, A. W. Thwing. Can. Engr., vol. 38, no. 23, June 3, 1920, pp. 517-518, 3 figs. Details of new gravity dam at Marysville, N. B., total length of which is 500 ft., consisting of three waste sluices, 375 ft. rollway, log sluices and provision for future hydroelectric power-house.

Dams for Artificial Lakes Recently Built in Italy (Les digues pour lacs artificiels récemment construites en Italie), Luigi Luiggi. Annales des Ponts et Chaussées, vol. 54, no. 1, Jan.-Feb. 1920, pp. 62-95, 12 figs. partly on supp. plate. Gravity dams.

The St. Maurice River Regulation and the Gouin Dam, Olivier Lefebvre. Jl. Eng. Inst. Can., vol. 3, no. 7, July 1920, pp. 342-348, 3 figs. Gravity dam, 1646 ft. long and 20 ft. wide at crest. Highest section is 90 ft., width at base at that point being 72 ft.

Hydraulic-Fill. Hydraulic Fill at the Miami Conservancy Dams, C. S. Hill. Eng. News-Rec., vol. 85, nos. 11, 12 and 13, Sept. 9, 16 and 23, 1920, pp. 486-490, 547-550 and 600-603, 19 figs. Developments which resulted from study of experiments applied to hydraulic-fill operations of Miami Conservancy District. Among these are included manganese-steel centrifugal pump which, compared with cast iron, has doubled output life of pump shells and increased nearly tenfold output life of pump runners, and a new design of pump shell in white iron that has exhibited resistance to wear which indicates output life of 400,000 cu. yd. of heavy gravel and sand fill. Improved sump and pump layout reduces losses of head at suction. Manganese steel doubles and white iron quadruples pump output life. Discharge pipe life increased by using high carbon steel. Friction heads of 10 to 12 ft. developed in pumping heavy glacial drift.

Hydraulic Fill Construction of Huffman Dam. Public Works, vol. 49, no. 11, Sept. 11, 1920, pp. 232-234, 1 fig. Deficiency of fine material for core supplied by excavating hillside with monitor and sluicing it to core pool at minimum cost.

Hydraulic-Fill Dams, Allen Hazen. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 4, April 1920, pp. 525-557, 12 figs. Failure of so many hydraulic-fill dams is attributed to method of placing core commonly used which results in exceedingly fine-grained material. It is said that to use hydraulic method successfully it is necessary either to increase toes until they are large and heavy enough to resist full fluid pressure of core successively, or else to handle core material so that finest particles are wasted, leaving only larger ones, and in that way increasing grain size to point where drainage can be secured, and at the same time remaining sufficiently impervious for practical purposes.

Hydraulic Fill Dams for Miami Conservancy District. Public Works, vol. 48, nos. 17 and 18, May 8 and 15, 1920, pp. 391-394 and 419-422, 9 figs. May 8: Method of constructing earth dams with core embankments built up between side slopes enclosed by parallel levees, all made of materials excavated by dragline machines, hauled in dump cars, pumped to site and deposited by hydraulic operations. May 15: Method of building up levees, beaches and water-tight core by means of steam shovels, window pipes and other contrivances.

Measurements of Pressures in Core of Hydraulic Fill Dam. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, p. 585, 1 fig. At Miami Conservancy district. Central feature of measuring apparatus is pressure cell buried in earth of core at point where determination of pressure is desired.

Measuring Internal Pressures in Hydraulic-Fill Cores. Public Works, vol. 48, no. 24, June 26, 1920, pp. 553-555, 3 figs. Earth-pressure cells were varied at different depths in semi-fluid core, where relation between horizontal and vertical pressure indicated rate of solidification of material. Diagrams of pressures obtained are given.

Pressure Cells in Miami Conservancy Dams

Show State of Solidification of Core Material. Eng. & Contracting, vol. 53, no. 24, June 16, 1920, pp. 674-675. Information on results obtained from use of these cells, abstracted from March issue of Miami Conservancy Bul., including diagrams of earth pressures at Germantown dam.

Jackson Lake. Jackson Lake Dam the Savior of the Snake River Valley. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 992-994, 6 figs. How flush method of delivery was discarded for regulated continuous-flow method.

Leaks, Closing of. Method Employed in Closing a Leak Under a Dam, W. D. P. Warren. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 101-102. Mat of green willow trees was laid about wing and covered over with gravel, sand and clay.

Masonry. How the Central Gap of the Krishnarajasagara Dam was Raised from+60 feet to +75 feet above Bed During the Months of January to June 1920, M. G. Rangaiya. Mysore Engrs. Assn. Bul., vol. 5, no. 19, July 1920, pp. 151-159, 3 figs. Precautions taken to prevent leakages at line of junction.

Measuring Upward Pressure Under a Masonry Dam, E. W. Lane and E. L. Chandler. Eng. News-Rec., vol. 84, no. 21, May 20, 1920, pp. 1014-1016, 4 figs. Tests made on Island Park Dam at Dayton, Ohio, to determine extent of under pressure through porous foundations.

The Value of Up-Stream Treatment in Dams Founded on Stratified Rock. Indian Eng., vol. 67, no. 3, Jan. 17, 1920, p. 38, 3 figs. on supplement plate. Methods carried out in two masonry dams founded on rock having vertical and horizontal fissures full of argillaceous material in India is explained and rules are suggested for building dams on stratified rock.

Miami Conservancy District. The Hydraulic Fill Dams of the Miami Conservancy District, H. S. R. McCurdy. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 389-435, 26 figs. Placing by hydraulic method embankment aggregating 8,000,000 cu. yd.

See also Earth; Hydraulic-Fill.

Movable-Crest. Design and Operation of Movable Crest Dams, Wm. G. Fargo. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 157-159, 8 figs. Gates and movable weirs are classified and various means for operating gates are illustrated.

Pacific Coast Hydroelectric Project. Stupendous Hydro-Electric Development of the Pacific Gas & Electric Company. Elec. Traction, vol. 16, no. 5, May 1920, pp. 316-318, 3 figs. Notes on construction of 275-ft. dam.

Pressure Measurements. Study of Pressures in Hydraulic Dam Cores. Eng. News-Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1040-1044, 7 figs. Methods of Miami conservancy engineers to obtain data on core consistency and action. Ball soundings. Measurements of lateral and vertical pressure. Results to date on Germantown Dam.

Slab Pavements. Experience with Slab Pavements at Minatare Dam. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 689-690. Break repaired temporarily with sacks of gravel placed shingle fashion at dam of North Platte Project of U. S. Reclamation Service.

Storage, Illinois. New Storage Dams in Illinois. Eng. & Contracting, vol. 53, no. 6, Feb. 11, 1920, pp. 147-148, 1 fig. Reservoir will have depth of 14 ft. to spillway and will contain about 430,000,000 gal. Paper read before Ill. Soc. of Engrs.

Storage, New Jersey. The Wanaque Dam. Public Works, vol. 48, no. 14, Apr. 17, 1920, pp. 324-330, 4 figs. North New Jersey water supply is to be provided by impounding run-off from a 94-sq. mi. water shed in a reservoir of eleven billion gallons capacity, to be built in 3½ years. Details of special construction features involved by the requirements of the rigid specifications for imperviousness of embankment and concrete; extreme depth of core-wall trench, and maintenance during first year of construction operations of continuous flow in this river and water supply to large paper mill that will remain located and operating near center of dam site for months while construction is in progress around it.

Upward Pressure on. Measuring Upward Pressure on Dams. Eng. and Contracting, vol. 54, no. 10, Sept. 8, 1920, pp. 237-238, 2 figs. Investigations on Miami Conservancy District of Dayton, O.

[See also EXCAVATION, EARTH, Miami Conservancy District; HYDROELECTRIC PLANTS, Quebec; WATER WORKS, Denver; WEIRS.]

DAYLIGHT SAVING

Industry and. See LIGHTING, Daylight Saving.

DEHYDRATION

Commercial. Commercial Dehydration, Jonas E. Whitley. Jl. of Am. Soc. of Heat. & Vent. Engrs., vol. 26, no. 3, April 1920, pp. 341-352, 3 figs. Commercial possibility and economic advantages of dehydration are pointed out. Vacuum drying apparatus is sketched.

DENTAL ALLOYS

See ALLOYS, Dental.

DEOXIDIZERS

See METALS, Deoxidizers for.

DEPRECIATION

Accounting. See ACCOUNTING, Depreciation.

Electric Railways. See ELECTRIC RAILWAYS, Depreciation, Reserves for.

Reserve Fund. The Depreciation Reserve Fund, Williston Fish. Elec. Ry. Jl., vol. 55, no. 5, Jan. 31, 1920, pp. 239-247. Study of depreciation with reference to commission and court rulings. Arguments for establishment of depreciation reserve fund.

Water Works. See Water Works, Depreciation.

[See also DETERIORATION.]

DERRICKS

Crane-Erection. Largest Derrick Built to Erect Great Hammerhead Crane. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 172-174, 3 figs. It is said to handle 40 tons at 125-ft. reach of 252-ft. boom in building 350-ton fitting-out crane at Philadelphia Navy Yard.

DESTROYERS

See WARSHIPS, Destroyers.

DETECTORS

See RADIOTELEGRAPHY, Detectors; VACUUM TUBES, Uses.

DETERIORATION

Factors, Recording. Specific Depreciation as Applied to Mechanical Deterioration, W. W. Pollack. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 761-762, 1 fig. Suggested form for recording deterioration factors.

DETONATORS

Swedish. New Swedish Detonators (Neue schwedische Sprengkapsel), Clas Herlin. Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 15, no. 12, June 11, 1920, pp. 137-140, 13 figs. Describes Bofors detonator, developed by Torsten Wennerström, which is open at both

ends, the explosive composition being pressed in through end where bottom is otherwise located, thus effecting simplification of manufacture, strengthening of force of initial explosion, and a more secure attachment of safety disk cover. Advantages of new detonator over former types are enumerated.

DIAMONDS

Arkansas. Diamonds in Arkansas, Samuel W. Reyburn and Stanley H. Zimmerman. Eng. & Min. Jl., vol. 109, no. 17, April 24, 1920, pp. 983-986, 3 figs. Diamonds found have their origin in "pipe" of peridotite under geological conditions similar to those existing in South African fields. Article describes washing plant which is being built to determine conclusively whether stones are present in commercial quantity or are simply geological "freaks."

Artificial Production. Experiments on the Artificial Production of Diamonds, Chas. Algernon Parsons. Philosophical Trans. of Royal Soc. of Lond., series A, vol. 220, pp. 67-107, 12 figs. All hydrocarbons, chlorides of carbon, oxides of carbon, etc., are said to have deposited amorphous carbon or graphite on carbon rod electrically heated at any pressure up to 4400 atmospheres and in a few experiments up to 6000 atmospheres, and at 15,000 atmospheres carbon and graphite electrically heated were either directly transformed into soft graphite or first vaporized and then condensed as such. Firing high-velocity steel bullet with cupped nose through vaporizing carbon into hole in block of steel is claimed to have tested effect of momentary pressure of about 300,000 atmospheres on carbon initially near its melting point. A few minute crystals resembling diamonds are said to have been produced and it is believed they were probably formed from iron.

Dispersion. Remarks on Dr. L. Silberstein's Results in His Paper "On the Dispersion of the Diamond," Albert C. Crehore. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 440-445. Correcting Silberstein ratio for diamond to read 2.246 and multiplying this number by characteristic number of tetrahedron, namely, 2 2/3, writer finds 5.99, which is very close to whole number 6, atomic number of carbon.

World Fields. Diamonds, Sydney H. Ball. Eng. & Min. Jl., vol. 109, no. 22, May 29, 1920, pp. 1202-1209, 7 figs. Geological notes on the various diamond fields of the world.

DIE BLOCKS

See DROP FORGING, Die Blocks.

DIE CASTING

Advantages. Modern Die Cast Parts and Metals. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 45-50, 9 figs. Writer points out that late developments of dies now allows casting of brass, both in steel and in plastic dies of high heat resistance, and concludes that process has many advantages from viewpoint of machine-part designer whereby part itself can be strengthened as well as most efficiently and economically produced by die casting. Illustrations of various die cast parts are included.

Methods. Pressure and Vacuum Die Casting (Ueber Spritz- und Vakuumguss), Alfred Uhlmann. Giesserei-Zeitung, vol. 17, no. 2, Jan. 15, 1920, pp. 21-24, 6 figs. Details and illustrations of pressure and vacuum die-casting apparatus. Reference is made to a process worked out by writer for the cold die casting of certain metals.

Use. Die Castings, Their Various Uses and Advantages, J. H. Moore. Can. Machy., vol. 23, no. 12, Mar. 18, 1920, pp. 283-286, 8 figs. Practices of Fisher Motor Co., Orillia, Ont., Canada.

DIE STOCKS

Machining. Machining Operations on Die Stocks, J. V. Hunter. Am. Mach., vol. 52, no. 5, Jan. 29, 1920, pp. 231-232, 3 figs. Methods used by Reed Mfg. Co., Erie, Penn., in manufacturing die stocks for pipe dies.

DIELECTRIC CONSTANTS

Pressure Coefficients. The Dependence on Pressure of the Dielectric Constants of Water, Ethyl and Methyl Alcohol, and Aceton (Abhängigkeit der Dielektrizitätskonstante des Wassers, Aethylalkohols, Methylalkohols und Acetons vom Druck), G. Falckenberg. Annalen der Physik, vol. 61, no. 2, Jan. 15, 1920, pp. 145-166, 4 figs. Results of experiments to determine the pressure coefficient of the dielectric constants of water, ethyl and methyl alcohol and aceton. Report from the Physical Inst. of Rostock.

DIELECTRICS

Electrical Expansion. Experimental Researches of Electrical Deformations of Dielectrics (Recherches expérimentales sur les déformations électriques des diélectriques), B. L. Bouchet. Annales de Physique, vol. 12, no. 9, Nov.-Dec. 1919, pp. 303-442, 20 figs. Study of electrical expansion of glass, paraffin and ebonite when in contact with cylindrical condenser. Phenomena observed are explained by reference to "mechanical tractions" similar to hypothetical contention of Maxwell.

Residual Charge on. A Preliminary Experiment on the Dielectric Residual Charge, Hideo Tsutsumi and Hikoo Saegusa. Sci. Reports Tôhoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 207-213, 10 figs. partly on two supp. plates. Mica, ebonite, paraffin paper, celluloid and glass wire were tested.

Sparking Discharge. An Investigation on the Sparking Discharge Through the Surface of Dielectrics (In Japanese), H. Saegusa. Denki Gakkwai Zasshi, no. 378, Jan. 10, 1920, 62 pp., 44 figs. Paper read before Tokyo Local Section, Japanese Elec. Soc.

Variation of Conductivity with Frequency. On the Variation with Frequency of the Conductivity and Dielectric Constant of Dielectrics for High-Frequency Oscillations, G. E. Bairsto. Proc. Roy. Soc., vol. A96, no. A679, Jan. 2, 1920, pp. 363-382, 9 figs. Measurements of conductivity and dielectric constants of dry blotting paper, glass, vulcanized indiarubber, guttapercha, marble, and slate are given for alternating currents of low voltage and sine-wave form, and for wide range of high frequencies.

DIES

Armature-Disk. The Construction of a Punch and Die for an Armature Core Disk (Herstellung eines Schnittwerkzeuges für ein Ankerblech), L. Meissler. Werkstattstechnik, vol. 14, no. 9, May 1, 1920, pp. 257-259, 20 figs. Describes tools with capacity of 700 pieces per hour and life sufficient for 5-600,000 disks.

Automobile Parts. Dies for Automobile Oil Filler Cup, J. Bingham. Machy. (Lond.), vol. 16, no. 395, Apr. 22, 1920, pp. 78-79, 5 figs. Description of dies used in manufacture of an oil-filler cup or breathing tube for automobile engine, an illustration of each die in the order in which it is used, and a detail of shell as it appears after each operation.

Dies for Automobile Silencer Housings. Machy. (Lond.), vol. 16, no. 396, Apr. 29, 1920, pp. 103-104, 6 figs. Description and illustrations of dies used to make the two shells which form housing for a certain type of automobile silencer.

Dies for Automobile Wheel Hub, J. Bingham. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 603-604, 5 figs.; also Machy. (Lond.), vol. 16,

no. 403, June 17, 1920, pp. 330-331, 5 figs. It is related that in production of a wheel hub for a small automobile, nine dies were required to complete the part; methods pursued in production of this job and some of the dies employed are described.

Bending and Forming. Unusual Bending and Forming Dies, Frank A. Stanley. Am. Mach., vol. 52, no. 22, May 27, 1920, pp. 1127-1128, 4 figs. Dies for producing chute for coin-operated machine.

Die-Sinking Machines. Becker Die-Sinking Machine. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 277-278, 3 figs. Attention is especially called to feature of machine which allows operator, standing in his position at front of machine, to operate all hand and power feeds conveniently.

The Keller Automatic Die-Sinking Machine, S. A. Hand. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 158-160, 6 figs. Machine is designed for sinking dies such as are used for forging, glass molding, embossing, etc.

Forging. Standardizing Forging Die Blocks, C. B. Porter. Iron Trade Rev., vol, 67, no. 1, July 1, 1920, pp. 38-39, 5 figs. Economy in manufacture and improved service in delivering die blocks is believed will follow standardization of sizes, kind of steel used, and methods of forging, annealing and heat treating. Paper read before Am. Drop Forge Assn.

Grinding. See GRINDING MACHINES, Die Grinding.

Heat Treatment. See PUNCHES, Heat Treatment.

Motorcycle Parts. Dies for Shaping a Motorcycle Part, J. Bingham. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 808-809, 7 figs. Drawing and forming dies required for manufacturing muffler cap of unusual shape.

Screw-Plate. The Manufacture and Manipulation of Screw-Plate Dies (Die Herstellung von Schneideisen und ihre Behandlung beim Gebrauch), J. Blume. Werkstattstechnik, vol. 14, nos. 2 and 3, Jan. 15 and Feb. 1, 1920, pp. 33-37 and 77-80, 39 figs. Diagrams are given showing deviation of die screw threads from standards for Whitworth and Löwenherz threads, also formulæ for calculation of measurements of both types of threads. Devices used in their manufacture are described.

Seamless Water Pails. Dies for Seamless Water Pails, J. Bingham. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1118-1120, 5 figs. Dies employed in seven punch-press operations required in manufacture of a seamless water pail. Dies were developed at plant of Toledo Machine & Tool Co.

Shaving. Adjustable Trimming and Shaving Dies, Frank A. Stanley. Am. Mach., vol. 52, no. 4, Jan. 22, 1920, pp. 177-180, 9 figs. Method of blanking, trimming and shaving set of nine steel cams for calculating machine, cams varying in length throughout group of nine parts.

Combined Trimming and Shaving Dies, Frank H. Stanley. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 297-299, 10 figs. Forms of shaving dies combined with piercing tools.

Details of Shaving Dies, Frank A. Stanley. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 929-931, 10 figs. The shaving die, it is pointed out, makes it possible to attain desired results with less attention to quality of blanking dies and correspondingly more latitude is permissible in upkeep of latter tools.

Sheet-Metal. Interesting Examples of Sheet Metal Dies, J. H. Moore. Can. Machy., vol. 23, no. 22, May 27, 1920, pp. 497-499, 4 figs. Description and illustrations of revolving oil cover die, serrated washer die, tube spout die and large punching die, used by the International Harvester Co., Ltd., Hamilton, Can.

Shell-Drawing. See SHELL MANUFACTURE, Dies for.

Thread-Cutting, Caps for. The Manufacture of Caps for Threading Dies, F. E. Merriam. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 827-830, 12 figs. It is stated that much of efficiency of die depends upon correct machining of cap.

Trimming. A Cam-Operating Trimming Die, Chas. M. Brehm. Am. Mach., vol. 52, no. 25, June 17, 1920, pp. 1283-1284, 2 figs. Describes die devised by author that can be operated in an ordinary punching machine and which uses cams in a new way.

See also Shaving.

Upsetting Operations. Proper Upsetting and Its Advantages, F. H. Blakeslee. Am. Drop Forger, vol. 6, no. 7, July 1920, pp. 320-321, 4 figs. Discussion of dies used in upsetting operations.

Wire-Drawing, Diamond. Making Diamond Wire-Drawing Dies. Machy. (London), vol. 15, no. 382, Jan. 22, 1920, pp. 519-521, 5 figs. Manufacturing operations at Vianney Wire-Die Works, Trevoux, France.

DIESEL-ELECTRIC DRIVE

See TRAWLERS, Diesel-Electric Drive.

DIESEL ENGINES

Aeroplane. See AEROPLANE ENGINES, Diesel Type.

Air-Pressure Regulators. Influencing the Combustion Line of Diesel-Engine Indicator Cards (Die Beeinflussung der Brennlinie bei Dieselmotoren), Ludwig Ebermann. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 23-24, June 12, 1920, pp. 425-431, 22 figs. Points out necessity of altering air injection to correspond with variations in load, and suggests most suitable means therefor. Describes "MAN" air-pressure regulator of Benz & Co., Inc., and the Sulzer Bros. regulator.

Augsburg. World's Highest-Powered Naval-Type Diesel Engine. Automotive Manufacturer, vol. 61, no. 11, Feb. 1920, pp. 14-19 and p. 34. Details of Augsburg ten-cylinder 3000 hp. heavy-oil unit used in German submarine cruisers. Main dimensions are: Length overall, 37 ft. 5 in.; height, 11 ft. 6 in.; width, 5 ft.; bore and stroke, 20⅞x20⅞ in.; weight, 75 tons; engine speed, 375 r.p.m.

World's Highest-Powered Naval-Type Diesel Engine. Motorship, vol. 5, no. 1, Jan. 1920, pp. 25-28, 6 figs. Augsburg 3000-shaft-horsepower heavy-oil engine for German submarine-cruisers. Engine is of 10-cylinder, 4-cycle, reversible high-speed type and runs at 385 r.p.m.

Augustin Normand. Augustin Normand Marine Diesel Motors (Les moteurs Diesel Augustin Normand), Journal de la Marine, no. 1926, Feb. 21, 1920, pp. 88-89, 3 figs. Six-cylinder, 500-hp. type.

Beardmore-Tosi. The Beardmore-Tosi Marine Diesel Engine. Marine Engr. & Naval Architect, vol. 42, no. 512, May 1920, pp. 288-289, 2 figs. Among special features of this engine are a spiral path for cooling water around cylinder barrel, similar arrangement for piston crown, a patented design of cylinder head equalizing stresses imposed by high pressure working loads, and arrangement of valve gear such that alternately the exhaust valves are heated and cooled by intake of charging air of cycle.

Blast Pressure, Automatic Control. Automatic Control of Blast Pressure for Diesel Engines. Elec. Times, vol. 58, no. 1502, July 29, 1920, p. 89, 2 figs. Electrically operated gear-control apparatus. Built by Messrs. Mirrlees, Bickerton and Day, England.

British Improvement in. British Stationary Diesel Engines of To-day. Eng., vol. 128, no. 3328, Oct. 10, 1919, pp. 349-351, 6 figs. Among recent innovations are quoted employment of pilot jet system of paraffin to form flame for the ignition of following jet of tar oil, device for automatically controlling pressure of air blast to suit varying loads in central station work and points in manufacture such as grinding faces of ends of platforms so as to make them tight and not to allow any oil to drop on men below.

Burmeister & Wain. Marine Diesel Engines by Burmeister and Wain. Practical Engr., vol. 62, no. 1751, Sept. 16, 1920, pp. 181-185, 7 figs. Description of marine Diesel engines for twin-screw and single-screw ships, electrical auxiliary machinery, and small and special engines.

Busch-Sulzer. A Description of the Busch Sulzer Diesel Engine. Power House, vol. 13, no. 11, June 5, 1920, pp. 250-253, 8 figs. Details of the Busch-Sulzer type B four-cycle engine, built for heavy-duty service with all parts accessible for inspection and adjustments; bedplate is made in one piece with saddles or bridges between each pair of cylinders, which are bored to receive main bearing shells.

The Busch-Sulzer Two-Cycle Diesel Engine. Power, vol. 52, no. 2, July 13, 1920, pp. 46-49, 7 figs. Engine is of vertical four- or six-cylinder single-acting cross-head type.

The Busch-Sulzer Diesel Engines, C. H. Peabody. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 752-756, 9 figs. Engines are operated on two-stroke cycle, scavenging and charging air being admitted through ports in cylinder liner, so that only fuel valve is required to be fitted in cylinder head.

Cammellaird-Fullagar. A New Marine Oil Engine. Shipbuilding and Shipping Rec., vol. 15, no. 5, Jan. 29, 1920, pp. 131-132 and 137, 7 figs. Cammellaird-Fullagar opposed piston two-stroke-cycle Diesel engine.

Cammellaird-Fullagar Diesel Marine Engine. Motorship, vol. 5, no. 4, April 1920, pp. 302-306, 6 figs. Description of 1000-shaft-hp. opposed-piston type heavy-oil marine engine. It weighs 91 long-tons and is 19 ft. 9 in. long.

The Cammellaird-Fullagar Diesel Engine. Engr., vol. 129, nos. 3344 and 3345, Jan. 30 and Feb. 6, 1920, pp. 107-110, 7 figs., and 132-133, 2 figs. Details of engine of opposed-piston type.

The Cammellaird-Fullagar Marine Diesel Oil Engine. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 144-146, 8 figs., partly on supplate. Two-cycle opposed-piston type. It is said that small space occupied by this engine permits its replacing steam engine and boilers of existing steamships without altering shafting or propellers.

The New Cammellaird-Fullagar Opposed Piston Type of Marine Oil Engine. Int. Mar. Eng., vol. 25, no. 4, April 1920, pp. 327-329, 3 figs. Each unit of two cylinders is carried upon two cast-iron columns which on inner side form crosshead guides. There is no bearing between two adjacent cranks, so that length of engine is relatively small. It is claimed for this motor that its weight for a given power is lower than any existing type, while the space occupied is smaller.

Cards from. Some Cards from a Diesel Engine, G. Ure-Reid. Engineer, vol. 128, no. 3333, Nov. 14, 1919, p. 497, 9 figs. Attention is called to difference in results obtained from engine when (1) each cylinder had separate pump discharging through accumulator to its spray valve, and (2), where separate pumps discharged through their accumulators to common pipe and then to spray valves.

Castings for. Diesel Engine Castings, F. J. Cook Eng., vol. 109, no. 2823, Feb. 6, 1920, pp. 177-179, 9 figs.; also Foundry Trade Jl. & Pattern-Maker, vol. 22, no. 222, June 1920, pp. 440-443, 6 figs. Percentages of various chemical elements which were found to give good results for Diesel-engine cylinders, liners and pistons are: Total carbon, 3 to 3.2; silicon, 1 to 1.2; phosphorus, not over 1; sulphur, 0.12; manganese, not over 0.5. Paper read before North-East Coast Instn. Engrs. & Shipbuilders.

See also IRON CASTINGS, Diesel-Engine.

Design. Principal Data of Modern Diesel Engines (Die wichtigsten Werte der heutigen Diesel-Maschinen), Aurhur Balog. Der praktische Maschinen-Konstrukteur, vol. 53, no. 23-24, June 10, 1920, pp. 209-216. From all available statistical information concerning foreign and domestic types of Diesel engines, a table is compiled giving most important data, as a guide for designing engineers.

Some Notes on the Design and Construction of Diesel Engines. Motorship, vol. 5, no. 1, Jan. 1920, pp. 40-41, 4 figs. Table giving piston speeds in various makes of 4-stroke engines and diagram showing piston effort curve for 4-stroke engine are studied and conclusions drawn in regard to most suitable stroke-bore ratio.

Experimental Work. Some Experimental Work in Connection with Diesel Engines, C. J. Hawkes. Eng. & Indus. Management, vol. 4, no. 5, July 29, 1920, pp. 141-144, 3 figs. Outline of experimental work carried out at Admiralty Engineering Laboratory in connection with internal-combustion engines for naval purposes, with special reference to design and performance of single-cylinder engine of comparatively large power. Paper read before Inst. Naval Architects.

German Submarine. German Submarine Diesel Engines. Eng., vol. 109, no. 2836, May 7, 1920, pp. 613-614. It is stated that four-cycle engine was preferred in Germany for use in submarines because it involved fewer difficulties of construction and as it was more developed it was more reliable. Translated from "Schiffbau."

German Submarine Diesel Engines, Philip H. Smith. Petroleum World, vol. 17, no. 232, Jan. 1920, pp. 35-38, 4 figs. Discusses their adaptability for industrial purposes.

Modern German Submarine Diesel Engines (Neuere deutsche Unterseeboots-Dieselmaschinen), Max W. Gerhards. Motorwagen, vol. 23, nos. 14, 15, 19 and 20, May 20, 31, July 10 and 20, 1920, pp. 237-251, 264-269, 343-347 and 360-365, 46 figs. Discussion of interesting features of their construction; details of up-to-date engines of the Krupp Corp., Daimler Motor Co., Körting Bros., Ltd., German General Elec. Co., Benz & Co., etc., with diagrams showing their working efficiency.

The Diesel Engine of the German Submarine U-117, Holbrook C. Gibson. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 15-18, 1 fig. Engine is of 1200-hp., six-cylinder type and has air compressor on forward end. Bedplate comes right up, instead of being bolted on flange, and forms housing. Both bedplate and housing are thoroughly ribbed. Cylinder jackets come out in a skirt which gives vertical structure and strength.

Governors. The Influence of the Combustion Line in Diesel Engines, Ludwig Ebermann. Gas Engine, vol. 22, no. 10, Oct. 1920, pp. 281-288, 22 figs. Sulzer injection pressure governor and other types of governors. Translated from Zeitschrift des Vereines deutscher Ingenieurs.

High-Altitude Operation. Diesel Engines Under High Altitude Conditions, Theodore M. Robie. Eng. & Min. Jl., vol. 109, no. 23, June 5,

1920, p. 1269, 1 fig. It is shown analytically how pressure in cylinders may be considerably reduced and still obtain same temperature at end of compression as at sea level.

Lubrication. Approved Methods of Diesel-Engine Lubrication, R. C. DeMary. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 188-190. Advocates use of asphalt-base oil with graphite.

Marine. Merchant Marine Diesel-Engine Construction in Switzerland. Motorship, vol. 4, no. 11, Nov. 1919, pp. 44-49, 16 figs. Shop tests of new-model 1250 shaft hp. Sulzer two-type motor. Preliminary details of 4200 shaft hp. (5550 i.hp.) cargo—and passenger—ship model. 40 ft. engine-room for 3000 i.hp.

Nearly Half-a-Million Horse-Power in Marine Heavy-Oil Engines. Motorship, vol. 4, no. 11, Nov. 1919, pp. 33-44, 13 figs. Notes on constructional features of machines built by Vickers, Ltd., with remarks on question of solid-injection of fuel.

Progress in Marine Diesel-Engine Building at Krupp's during the War, Otto Alt. Motorship, vol. 5, nos. 7, 8 and 9, July, Aug. and Sept. 1920, pp. 604-606, 694-696 and 804-806, 22 figs. July: For 1250 shaft hp., four-cycle type is being constructed; for over 4000 shaft hp., double-acting port-scavenging two-cycle sets; and for 19,000 shaft hp., four-cycle sets in 12 cylinders with supercompression. Aug.: Discusses injection type of engine, heat stresses, etc. Sept.: Success of marine Diesel-engine is recorded and fundamental development of Diesel locomotives is visualized.

The General Trend of Diesel Marine Machinery. Eng., vol. 109, no. 2836, May 7, 1920, pp. 617-618. Survey of types being built in various countries.

The Manufacture of the Marine Diesel Engine. Machy. (Lond.), vol. 16, no. 408, July 22, 1920, pp. 477-484, 20 figs. Manufacturing principles adopted in North British Diesel Engine Works, Ltd.

The Sulzer Two-Stroke-Cycle Marine Diesel Engine (Der Sulzer-Zweitakt-Dieselmotor als Antriebsmaschine von Frachtschiffen). Schiffbau, vol. 21, nos. 21 and 22, Apr. 14 and 21, 1920, pp. 583-589 and 617-621, 18 figs. It is claimed that the two-stroke engine in regard to dimensions and weights and therefore construction costs, is greatly superior to the four-stroke engine, and that in comparison with other cargo ships, the two-stroke motorship with equal water displacement possesses much the greatest carrying capacity.

See also Augsburg; Augustin Normand; Beardmore-Tosi; Burmeister & Wain; Cammell-laird-Fullagar; Nelseco; Neptune; Skandia; Testing; Two- vs. Four-Cycle; Werkspoor; White; Worthington.

Nelseco Heavy-Duty. Nelseco 360 Hp. Heavy Duty Marine Diesel-type Engine. Automotive Manufacturer, vol. 61, no. 9, Dec. 1919, pp. 12-14, 6 figs. Engine is of four-cycle, reversing gear type and uses crude or fuel oil for fuel. Cylinders are of cast iron, cast separately and have water-jacketed barrels and heads. Ratio bore-stroke is 1 :1.384.

Neptune. The Neptune Marine Diesel Engine. Engineer, vol. 128, no. 3334, Nov. 21, 1919, pp. 520-522, 3 figs. Two-cycle engine of 1500 i.hp. in six cylinders at 115 r.p.m.

New British. New British Diesel Engine. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 29-3[illegible] 2 figs. Motor built by Swan, Hunter & Wigham Richardson, constructors of Mauretania. In this engine scavenging cylinders are used for starting purposes and compressed air at 100 to 150 lb. per sq. in. is admitted below scavenging piston through change valve and piston valve.

Oil-Field Pumping Plants. The Diesel Engine, W. F. Parish. Gas Engine, vol. 22, no. 6, June 1920, pp. 168-169. Result of tests made in various pumping plants owned by the Sinclair Oil & Refining Co., which operates 2800 miles of trunk and gathering pipe lines; most of power for pumping oil is supplied by 64 pumping stations located at intervals of about 40 miles, which are equipped with four different makes of American Diesels and some of most interesting of these installations are described.

Otto. The Otto Crude and Fuel Oil Engine. Gas Engine, vol. 22, no. 6, June 1920, pp. 194-199, 11 figs. Description and illustrations of a new horizontal Diesel manufactured by the Otto Engine Mfg. Co., of Philadelphia.

Single-Cylinder of Large Power. Some Experimental Work in Connection with Diesel Engines, C. J. Hawkes. Shipbuilding and Shipping Rec., vol. 16, no. 3, July 15, 1920, pp. 95-99 and (discussion), 100, 3 figs. Outline of experimental work carried out at British Admiralty Engineering Laboratory in connection with internal-combustion engines for naval purposes, with special reference to the design and performance of a single-cylinder engine of comparatively large power. Paper read before Instn. of Naval Architects.

Skandia. Americanizing an European Engine. Motorship, vol. 5, no. 1, Jan. 1920, pp. 21-24, 9 figs. Details of 1150 i.hp. Skandia-Werkspoor four-cycle marine-Diesel engine for U. S. Shipping Board Emergency Fleet Corporation.

A Pacific Coast Marine Diesel Engine. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 381-383, 1 fig. Six-cylinder single-acting four-cycle, Diesel engine rated at 1100 i.hp. and 825 b.hp. when operated at 135 r.p.m. Cylinders have 20½-in. bore and 35½-in. stroke.

First Large Marine Diesel Engines Complete on Pacific Coast, Frederik Van Rossen Hoogendyk. Pacific Marine Rev., vol. 17, no. 4, Apr. 1920, pp. 107-111, 5 figs. Description of 1100-i.hp. Diesel engines building at Skandia Pacific Oil Engine Co. under license of Dutch Werkspoor Co. for U. S. Shipping Board Emergency Fleet Corporation. Engines are 4-cycle, single-acting marine crosshead type, 20½-in. bore, 35½-in. stroke and 135 r.p.m.; built-up crankshaft is 12½ in. in diameter.

Solid-Injection Type. Notes on the Care and Maintenance of the Solid Injection Diesel Engine, David P. Peel. Trans. Inst. of Marine Engrs., vol. 31, Feb. 1920, pp. 563-572, 4 figs. Notes based on writer's experience with the Vickers' solid-injection submarine Diesel engine, on smoking, knocking in the cylinders, bearing lubrication, cylinder lubrication, the governor, water cooling, fuel, setting sprayer valves, and diagram of operations.

The Care and Maintenance of Solid Injection Diesel Engines, David P. Peel. Elec. Times, vol. 58, no. 1499, July 8, 1920, pp. 32-33, and (discussion) 33-34, 1 fig. Practical notes dealing with smoking, knocking in the cylinders, bearing lubrication, cylinder lubrication, the governor, water cooling, setting of sprayer valves, etc.

Submarine. See German Submarine.

Sulzer. See Marine.

Supercharging. Surcharging Diesel Engines, Cl. Ruegg. Power, vol. 51, no. 18, May 4, 1920, pp. 712-714, 9 figs.; also Gas Engine, vol. 22, no. 6, June 1920, pp. 187-189, 9 figs. Supercharging is said to have proven successful with two-cycle Diesel engine for direct connection to air compressor in plant operated at 6000 ft. above sea level. Quantity of fuel that can be economically burned in a Diesel-engine cylinder is said to be limited by weight of air in cylinder, and practice of supercharging is of special value when operating at high altitudes.

Tar Fuel. The Use of Raw Tars for Diesel Engines, Harold Moore. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1075-1076. Their chemical and physical properties and required characteristics.

Testing. Testing High-Powered Marine Oil-Engines. Motorship, vol. 5, no. 1, Jan. 1920, pp. 31-33, 4 figs. Dynamometer commonly used by engine builders.

Tests. Some Experimental Work in Connection with Diesel Engines, C. J. Hawkes. Eng., vol. 110, no. 2847, July 23, 1920, pp. 127-131, 8 figs. Outline of experimental work carried out at Admiralty Engineering Laboratory in connection with internal-combustion engines for naval purposes, with special reference to design and performance of single-cylinder engine of comparatively large power. Paper read before Instn. Naval Architects.

Two- vs. Four-Cycle. Comparison Between Marine Diesel-Engines of the Two and Four Cycle Types. Motorship, vol. 5, no. 4, April 1920, pp. 313-315, 6 figs. Practice of principal motorship builders of the world. Opinion is expressed that four-cycle engines, judging from present tendencies, "will be the marine motor of the future." Paper read before Norwegian Veritas.

The Four-Cycle Versus Two-Cycle Marine Diesel Engine, James Richardson. Motorship, vol. 5, no. 6, June 1920, p. 527. Writer maintains that the four-cycle engine for marine work is standard today, and will only be challenged when two-cycle engine designers squarely face necessity for providing for moderate mean-effective pressures in the working cylinders, rigid structures, accessibility and ample auxiliaries. British engineer's reply to Sulzer Freres' article in March issue of same journal.

Valve Gear. Notes on the Valve Gear of Diesel Engines. Mech. World, vol. 67, no. 1722, Jan. 2, 1920, p. 8, and vol. 68, no. 1751, July 23, 1920, p. 65, 11 figs. Jan. 2: Study of valve diagrams. July 23: Reversing of two- and four-cycle engines.

Vibrations. The Prevention of Noises and Vibrations Transmitted by Diesel Engines (Die Uebertragung von Geräuschen und Erschütterungen bei Dieselmotoren und ihre Verhinderung), W. Gerb. Oel- u. Gasmaschine, vol. 17, no. 6, June 1920, pp. 88-89, 1 fig. Describes equalizing apparatus for 800-hp. horizontal tandem steam engine which is said to offer under all conditions a guarantee against the transmission of objectionable vibrations.

Vickers. See Marine; Solid; Injection Type.

Werkspoor. The New Werkspoor Engine. Motorship, vol. 4, no. 11, Nov. 1919, pp. 54-60, 8 figs. Details of recent changes, particularly in reversing mechanism.

The Werkspoor Engine. Engr., vol. 129, no. 3357, April 30, 1920, pp. 446-448, and p. 450, 9 figs. Progress in design of Diesel engines built at Nederlandsche Fabriek of Amsterdam. One set installed on board Salerno, a ship of 6700 tons deadweight, is described.

See also Skandia.

White. Two-Stroke Cycle White-Diesel Engines. Shipbuilding and Shipping Rec., vol. 15, no. 16, April 15, 1920, pp. 512-514, 6 figs. Six-cylinder, 250-b.hp. engine running at 375 r.p.m., built by J. Samuel White & Co., Ltd., Isle of Wight.

Winton. Winton Diesel Oil Engines. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 387-388, 3 figs. Features of stationary type.

Worthington. America's Largest Four-Cycle Marine Oil-Engine, Thos. Orchard Lisle. Motorship, vol. 5, no. 6, June 1920, pp. 500-508, 21 figs. Details of new Worthington 2400-i.hp. merchant-ship Diesel motor, said to be developed from best European practices.

The Worthington Marine Diesel Oil Engine. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 672-686, 23 figs., 1 on suppl. plate. Six-cylinder, four-cycle reversible marine Diesel engine, capable of developing 2400 i.hp. at 120 r.p.m.

Worthington 2,400-Horsepower Marine Diesel. Power, vol. 52, no. 13, Sept. 28, 1920, pp. 506-509, 6 figs. Engine is of vertical single acting crosshead type and has six cylinders mounted on cast-iron A-frames, which in turn are mounted on bedplate or base. General dimensions are: b.hp., 1750; mechanical efficiency, 75 per cent; bore 29 in.; stroke, 46 in.; compression, 500 lb.; injection, 900 lb.; total weight, 339¼ tons.

[See also CENTRAL STATIONS, Oil-burning Engines for; SEMI-DIESEL ENGINES.]

DIFFERENTIAL EQUATIONS

See EQUATIONS, Differential.

DILATOMETER

Interferential. A New Interferential Dilatometer, Irwin G. Priest. Sci. Papers Bur. Standards, no. 365, Feb. 28, 1920, pp. 667-678, 2 figs. Apparatus is designed to measure small changes in length by "change in width" of interference fringes, instead of measuring them by "displacement" of fringes.

DILUTION

Law of. Some Recent Investigations on the Dilution Law, J. R. Partington. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 98-121. Survey of technical literature on dilution law which has appeared since 1910.

DIRECTION FINDERS

Aeroplane Installation. How Aeroplanes Are Navigated by Wireless, R. Keen. Wireless World, vol. 7, no. 82, Jan. 1920, pp. 578-582, 2 figs. Description of installation of direction finder in standard type of aeroplane.

British Army. Wireless Direction Finders, H. Riall Sankey. Engineering, vol. 108, no. 2807, Oct. 17, 1919, pp. 523-524, 11 figs. Apparatus developed by British army during war.

Deviations Aboard Ship. The Diffraction of the Field by a Cylinder and its Effect on Directive Reception on Board a Ship, René Mesny. Radio Rev., vol. 1, no. 11, Aug. 1920, pp. 532-540, 4 figs. Outline of theory for deviations observed in radiogoniometer aboard ship.

Fessenden Peloris. The Fessenden Peloris (Wireless Compass): A Caution as to Its Use, Reginald A. Fessenden. Elecn., vol. 83, no. 2170, Dec. 19, 1919, pp. 719-721, 15 figs. Description of direction finder which gives direction of source of electromagnetic waves relative to lubber line of ship, together with suggestions in regard to precautions used in order to obtain accurate results.

Fixed-Aerial Type. Wireless Direction Finders, H. Riall Sankey. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 545-547, 16 figs. Apparatus in which aerials are fixed and readings are taken by rotating small handle.

Kolster. Kolster's Direction Finder. Wireless Age, vol. 7, no. 2, Nov. 1919, pp. 24-25, 1 fig. Comprises two sets of rectangular coils of several turns, planes of which are at an angle with respect to each other and the two coils of each set being connected in series with each other and with adjusting turning condenser.

Long-Wave. Variation in Direction of Propagation of Long Electromagnetic Waves, A. Hoyt Taylor. Dept. of Commerce, Sci. Papers of Bur. of Standards, no. 353, 1919, pp. 419-433, 5 figs. Experimental investigation with long-

wave direction-finder coil undertaken to determine feasibility of using such long-wave direction finders on large aircraft on long flights, such as for instance a transatlantic flight.

Loop Aerial. Absolute Direction Finding with a Loop Aerial. Wireless World, vol. 8, no. 10, Aug. 7, 1920, pp. 350-351, 2 figs. Frame aerial with sheet of wire gauze in center. British patent.

Marine. Marine Radio-Goniometer (Radiogoniomètres de bord), René Mesny. Bulletin Technique du Bureau Veritas, vol. 1, nos. 6 and 7, Nov. and Dec. 1919, pp. 93-95, 6 figs., and 114-118, 6 figs. Principle of operation and installation. Precaution to avoid errors in measurements taken.

Method of Using. A Method of Direction Finding of Wireless Waves, and Its Applications to Aerial and Marine Navigation, James Robinson. Radio Rev., vol. 1, nos. 5 and 6, Feb. and March 1920, pp. 213-219 and 265-275, 7 figs. Feb.: Methods in which coils can be placed actually on position which indicates bearing, thus avoiding necessity of having to determine two positions where signals are just audible. March: Application of described method to Bellini-Tosi system is explained.

Operation. How Aeroplanes are Navigated by Wireless, R. Keen. Wireless World, vol. 7, no. 79, Oct. 1919, pp. 389-393, 3 figs. Operation of wireless direction-finder.

Reliability of. Radio Direction Changes and Variations of Audibility, Carl Kinsley and Albert Sobey. Proc. Inst. of Radio Engrs., vol. 8, no. 4, Aug. 1920, pp. 299-323, 12 figs. As result of large number of systematic measurements on direction of incoming signals, using loop reception, variations of considerable magnitude in apparent direction and occurring within short periods of time are found. Their dependence on length and character of wave are studied and certain possible theories of transmission are proposed to account for observed phenomena.

Scheller. The Action of Scheller's Wireless Direction Finder from an Aeroplane (Ueber die Wirkung von Schellers drahtlosem Kursweiser auf das Flugzeug), Eberhard Buchwald. Jahrbuch Zeitschrift für drahtlose Telegraphie u. Telephonie, vol. 15, no. 2, Feb. 1920, pp. 114-122, 7 figs. Results of experiments with Scheller's wireless direction finder and telegraph patented in 1907.

Uses in Navigation. Direction Finding by Wireless Telegraphy. Eng., vol. 128, no. 3329, Oct. 17, 1919, pp. 388-391, 12 figs. Principal features of wireless direction finder and methods of its application to navigation at night and under adverse weather conditions.

Zero Method, Application of. On the Goniometric Functions Applicable to Directive Aerials, A. Blondel. Radio Rev., vol. 1, nos. 1, 2 and 3, Oct., Nov. and Dec. 1919, pp. 1-10, 8 figs., 58-66, 1 fig., and 110-123, 4 figs. Indicates manner in which phase differences of electromotive forces induced in two vertical or nearly vertical parts of measuring aerial necessitate corrections, when dimensions of loop or frame are not very small compared with wave length employed. Application of "zero method" to direction finding; effect of wave decrement; errors due to neglecting damping.

[See also RADIOTELEGRAPHY, Direction Finding.]

DIRIGIBLES

See AIRSHIPS.

DISABLED MEN

Training of. The Psychology of Industrial Convalescence, E. L. Collis. Eng. & Industrial Management, vol. 4, no. 14, Sept. 30, 1920, pp. 434-437. Treatment of physical disorders by adopting system of graduated work after initial period of rest.

DISKS

Rotating, Stresses in. See STEAM TURBINES, Rotors.

DISSOCIATION

Electrolytic. Some Aspects of the Electrolytic Dissociation Theory, Nil Ratan Dhar. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 81-93. Discusses hypothesis on conditions of dissolved electrolytes put forward by Snethlage (Zeit. phys. Chem., 1915, 90, 1, 139).

DISTILLATION

Brown's Formula for. On Brown's Formula for Distillation, Sydney Young. Sci. Proc. Roy., Dublin Soc., vol. 15, no. 47, Jan. 1920, pp. 667-672. Brown's formula was found to be applicable without serious errors to mixtures of benzene and toluene.

Condensers for. See CONDENSERS, Distillation.

Fractional. Modern Ideas of Distillation and Rectification (Idées modernes sur la distillation et la rectification), C. Berthelot. Chaleur et Industrie, no. 5, July-Aug. 1920, pp. 274-281, 7 figs. Chenard process for fractional distillation.

Plants. Distillation Plant, with Special Reference to the Rectification of Alcohol, Acetaldehyde, and Other Volatile Products and Continuous Ether Manufacturing Plant, Stephane Masfaraud. Jl. Soc. Chem. Indus., vol. 39, no. 17, Sept. 1920, pp. 299T-305T, 10 figs. Details of various distillation apparatus and rectifiers.

[See also HEAT PUMPS.]

DITCHES

See DRAINAGE; FLOW OF WATER, Ditches; IRRIGATION, Ditch Calculations.

DIVIDING ENGINES

Diffraction Gratings. Description of a New Dividing Engine for Ruling Diffraction Gratings, H. J. Grayson. Proc. Roy. Soc. Victoria, vol. 30, no. 1, Sept. 1917, pp. 44-95, 27 figs., on seventeen supp. plates. Ruling range varies from 20,000 lines per in., down to approximately 72,000 lines per in. Time kept in ruling single line varies from 5 to 10 sec., according to length of line ruled and degree of accuracy required.

DIVINING RODS

Uses. The Use of Divining Rods (Ueber die Verwendbarkeit der Rutengänger), H. Machwirth. Zentralblatt der Bauverwaltung, vol. 40, no. 3, Jan. 10, 1920, pp. 17-19. Discusses possibilities of their use in water works, for location of points exposed to danger from electric storms, location of pipe lines, cables, tunnels, etc., of older construction where plans are missing, and determination of leaky spots in water mains, tanks, dams, etc.

[See also EARTH, Crust, Examination of; Subsurface Exploration; GEOLOGY, Divining Rods.]

DOCKS

Floating. See DRYDOCKS, Floating.

Gates. New Type Dock Gates for High Water Heads (Dokdeuren voor groot verval), J. P. Josephus Jitta. Ingenieur, vol. 35, no. 35, Aug. 28, 1920, pp. 620-621, 3 figs. Dock gate at Ymuiden, Holland, supporting maximum head of 65 ft. 6 in. Width is 36 ft. Frame consists of horizontal bow-string plate girders 6 ft. 6 in. deep in center, spaced 8 ft. 10 in. apart, and connected together by vertical posts.

Material Handling. See HANDLING MATERIALS, English Docks, System on.

Outfitting Dock. The Outfitting Dock, Ralph I. Paddock. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 809-811, 1 fig. Chart showing length of outfitting dock required for various dock capacities and weeks of outfitting.

DOLOMITES

Comparison of. A Comparison of Dolomites, Albert Rotbrock and J. B. Shumaker. Chem. News, vol. 120, no. 3118, Jan. 16, 1920, pp. 29-31. Chemical composition of samples from various districts of U. S., England, Switzerland and Germany.

DORR CLASSIFIER

See ORE CONCENTRATION, Machine for.

DOUGLAS FIR

See TIMBER, Specifications.

DOW METAL

See MAGNESIUM ALLOYS, Dow Metal.

DRAFT

Balanced, Savings With. Savings Effected With Balanced Draft Systems. Coal Trade Jl., vol. 50, no. 46, Nov. 12, 1919, pp. 1315-1316. Installations where savings amounting to 21.8 per cent. and 19.2 per cent. were effected.

Indicators. The "Usco" Boiler Draught Indicator. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 558-559, 3 figs. Instrument comprises three indicating units enclosed in cast iron, dust-tight case, provided with plate glass window. Each unit consists of central glass tube connected at its upper end to point at which it is desired to measure pressure.

DRAIN PIPE

See PIPE, DRAIN.

DRAINAGE

Assessments for. The Assessment of Drainage Districts, Lewis E. Ashbaugh. Iowa State College of Agriculture & Mechanic Arts, vol. 5, no. 2, Nov. 1906, 18 pp., 2 figs. Principles are suggested for governing distribution of expenses over various tracts, and also arithmetical method for computing assessments. Principle followed is that "assessment must be proportionate to the benefits received."

Channel Walls, Maintenance of. Gunite Maintenance of Chicago's Drainage Channel Walls, W. T. Christine. Eng. World, vol. 16, no. 8, June 1920, pp. 459-461, 6 figs. Treatment of breaches in wall is illustrated.

Diagrams for. New Diagrams for Drainage Work, J. C. D. Taylor. Can. Engr., vol. 39, no. 14, Sept. 30, 1920, pp. 383-384, 2 figs. Simplification of nomographic curves for designing ditches by Kutter's formula.

Ditches, Maintenance of. Studies of Maintenance Work on Drainage Ditches, H. M. Lynde. Eng. News-Rec., vol. 84, no. 15, April 8, 1920, pp. 713-715, 2 figs. It is concluded from experiments conducted by Bur. Public Roads that channels of drainage ditches need to be cleaned annually to insure proper flow capacity and sanitary conditions, but that banks need to be cleared only at intervals of from 3 to 5 years.

Ditches vs. Tile Drains. Open Ditches Excel Tile Drains for Country Roads, Frank T. Danielson. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, p. 401, 2 figs. Experience with hand-dug ditches constructed and maintained at small cost by village communities near Chicago.

Farm. Recommendations for Farm Drainage, W. J. Schlick. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 19, Oct. 9, 1918, 24 pp. Graphs are included for computing capacities of tile drains based on calculations by Kutter's formula with $n = 0.015$.

New Orleans. The Drainage System of New Orleans. Southern Engr., vol. 32, no. 2, Oct. 1920, pp. 38-44, 11 figs. Total drainage pumping capacity of system is over 7,000,000,000 gal. a day and total subsurface drainage and connections maintained is 386.25 miles. Area drained is 25,000 acres. There are six electrically operated pumping stations containing 30 pumps.

Roads. See ROADS, Drainage.

Underground Systems. The Spacing and Depth of Laterals in Iowa Underdrainage Systems and the Rate of Runoff from Them with Data from Investigations, W. J. Schlick. Official Publication Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 20, Oct. 16, 1918, 119 pp., 70 figs. Investigation undertaken to collect information as to operation of typical and special underdrainage systems with a view to suggesting improvements in underdrainage systems in use.

Underground Water. The Draining Away of Underground Water and Damage to Vegetation (Grundwasserabsenkung und Vegetationschädigung), Th. Wegner. Glückauf, vol. 55, no. 43, Oct. 25, 1919, pp. 834-837. It is pointed out that withdrawal of underground water seldom causes damage to vegetation, but should such damage occur, it is of great importance to compare actual productiveness of neighboring territory of same geological construction not affected by the withdrawal of water, with that of the area with lowered groundwater.

[See also TILE, Drain.]

DRAWBRIDGES

See BRIDGES, MOVABLE.

DRAWING

Metal. See METAL DRAWING.

Pneumatic Die Cushions. Pneumatic Cushions in Metal-Drawing Operations, John Nelson. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 726-729, 5 figs. Description of various types of pneumatic die cushions used in connection with punch presses, and methods of installing.

DRAWINGS

Changes on, Recording. Indicating and Recording Changes on Drawings, Fred R. Daniels. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 605-608, 4 figs. Description of method by which alterations on drawings may be definitely recorded for future reference.

Dimensioning. Practice in Making Component Drawings, Earle Buckingham. Machy. (Lond.), vol. 16, no. 393, Apr. 8, 1920, pp. 7-11, 7 figs. Deals with application of principles of dimensioning drawings and indicating tolerances.

Filing. A System of Filing Drawings, Nelson Hall. Eng. News-Rec., vol. 85, no. 2, July 8, 1920, p. 76, 1 fig. Describes system devised for a particular shop, advantage of which is that all drawings are together so that they can be leaved, measured, taken out and replaced as often as needed with least possible trouble.

DREDGES

Gold-Mining. Largest Capacity Gold-Mining Dredge in the World, H. G. Peake. Eng. & Min. Jl., vol. 109, no. 20, May 15, 1920, pp. 1106-1109, 3 figs. Describes the Estabrook dredge, with largest buckets built for placer mining, erected at considerable distance from railroad, necessitating heavy haulage over mountain roads; wooden hull constructed from timber sawn on ground.

Hydraulic. Improved Design for Dredge Pump Sump for Hydraulic Fill Construction, H. S. R.

McCurdy. Eng. and Contracting, vol. 54, no. 3, July 21, 1920, pp. 57-59, 4 figs. New installation pumped 222 cu. yd. per hr., amount being limited only by what draglines could excavate.

Measuring Velocity of Discharge from Hydraulic Dredge Pipes, Pierce J. McAuliffe. Eng. News-Rec., vol. 85, no. 2, July 8, 1920, pp. 62-64, 7 figs. Field method of controlling performance of dredge pumping.

Improved, Need of. Larger Ships, Deeper Harbors, and Better Dredges, A. W. Robinson. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, p. 949. Calls attention to need of better dredging machinery to meet present-day conditions and of deeper channels and harbors in order to obtain increased economy in marine transport.

DREDGING

Centrifugal-Pump. A Dredging Pump of Novel Construction, Walter J. White. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 1-7 and 80, 13 figs. Modification of dredges employed in construction in canal connecting Mississippi River with Lake Pontchartrain was necessitated by reason of large number of stumps of trees and roots which it was desired to pump through dredge. Accordingly pump casings and impellers of 20-in. dredge were modified by changing shape of throat ring and fitting new piece of suction pipe and cutting out two-thirds of each alternate vane.

Dredging New Orleans' Inner Harbor Navigation Canal, Walter J. White. Proc. Louisiana Eng. Soc., vol. 6, no. 2, April 1920, pp. 80-102, 12 figs. Performance and tests of centrifugal dredging pumps. Paper presented at joint meeting of Louisiana Eng. Soc. and Local Chapter of Am. Soc. of Mech. Engrs.

Electric. Electric Dredging on the Yukon, Allen E. Ransom. Elec. Jl., vol. 17, no. 3, Mar. 1920 pp. 86-90, 13 figs. Dredge and characteristics and operating data.

New Orleans Inner Harbor. See Centrifugal-Pump.

Pipe-Line. Pipe-Line Dredging in the Open Gulf of Mexico, T. E. L. Lipsey. The Military Engr., vol. 12, no. 63, May-June 1920, pp. 251-254, 2 figs. Work done on Atchafalaya Bay Ship Channel, which is 14 ft. deep at mean low Gulf, and 200 ft. wide on bottom. Dredging done for a distance of 15¾ mi. in the Gulf.

Stumpy Ground. Special Impellers for Pumps in Dredging Stumpy Ground, Walter J. White. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 166-170, 11 figs. Centrifugals on New Orleans industrial canal, it is said, were rebuilt like wood sewage trash pumps and efficiency increased.

DRIFTS

Applications of. Making and Using Drifts, H. F. Pusep. Am. Mach., vol. 51, no. 17; Oct. 23, 1919, pp. 757-760, 10 figs. Illustrating possible applications of drifts.

DRILLING

Cradle Forgings. Unusual Methods of Securing Extreme Accuracy, A. L. DeLeeuw. Am. Mach., vol. 52, no. 18, April 29, 1920, pp. 937-941, 16 figs. Operations of drilling and boring two main holes in cradle forging are taken up in detail. Methods used, types of tools and working limits are discussed.

High Production. Continuous Production Drilling. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 131-134, 12 figs. Methods whereby high production is obtained in drilling. Based upon practice of Baker Bros., Toledo, Ohio.

DRILLING MACHINES

Design. Designing a Special Drilling Machine, F. E. Johnson. Machy. (N. Y.), vol. 26, no. 10, June 1920, pp. 946-952, 10 figs. Factors to be considered in designing special machines, and a description of a machine developed for a specific drilling operation.

Foote-Burt. The Foote-Burt Company's Continuous Drilling and Turning Machines, J. V. Hunter. Am. Mach., vol. 52, no. 4, Jan. 22, 1920, pp. 165-169, 6 figs. Twelve-spindle continuous boring or drilling machine tended by one operator.

The Foote-Burt Inverted Drilling Machines, J. V. Hunter. Am. Mach., vol. 52, no. 5, Jan. 29, 1920, pp. 217-221, 11 figs. Single-spindle, multi-spindle and gang-type machines are described.

Jigs for. Drilling Jigs (Bemerkenswertes über Bohrlehren), K. Grimpe. Werkstattstechnik, vol. 13, no. 19, Oct. 1, 1919, pp. 297-300, 12 figs. Description and illustrations of three designs of drilling jigs which, when applicable, are said to simplify operation and effect considerable saving of time.

Moline Duplex. The Moline Duplex Drilling Machine, J. V. Hunter. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 147-149, 7 figs. Machines designed for rapid production. All of them are of two-head type but vary in method of operation in order to suit different classes of work.

Morris Radial. Morris Radial Drill. Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 49-50, 2 figs. Column construction does not vary greatly from standard practice except in being supported on both large ball bearing and roller bearing, arrangement which is said to permit swinging of arm with exceptional ease.

Multiple-Drilling Types. Foote-Burt "Way" Drilling Machine, J. V. Hunter. Am. Mach., vol. 52, no. 10, March 4, 1920, pp. 485-487, 7 figs. Multiple-drilling types which permit drilling on two, three or four sides of work at the same time.

Multiple-Spindle, Horizontal Type. Special Types of Drilling Machines. Machy. (Lond.), vol. 15, no. 390, March 18, 1920, pp. 778-780, 5 figs. Multiple-spindle horizontal drilling machine with cam-controlled quick-return feed.

Radial. New Radial Drill. Iron Age, vol. 106, no. 1, July 1, 1920, pp. 8-10, 5 figs. Machine having double-beam-section column with electric clamp.

Niles-Bement-Pond Radial Drilling Machines. Machy. (Lond.), vol. 16, no. 411, Aug. 12, 1920, pp. 593-595, 8 figs. Among features of design are included arrangement for passing arm through centre of double column, motor-driven column-clamping mechanism controlled by switch on drill head, an improved type of transmission from motor to spindle.

Ryerson-Conradson. The Ryerson-Conradson Radial Drilling Machine. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 774-775, 2 figs. Twin motor-driven, high-power machine, with only four shafts and sixteen gears.

Sensitive. Recent Machine Tool Developments, Joseph Horner. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 400-403, 18 figs. High-speed sensitive drilling machines.

Special Types. Designing a Special Drilling Machine. Machy. (Lond.), vol. 16, no. 404, June 24, 1920, pp. 352-358, 10 figs. General principles of design outlined. Description of a machine developed for a specific drilling operation given.

Special Types of Drilling Machines, F. E. Johnson. Machy. (N. Y.), vol. 26, no. 6, Feb. 1920, pp. 511-513, 5 figs.

See also MACHINE TOOLS, Special.

Spindles. Recent Machine Tool Developments, Joseph Horner. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 169-172, 15 figs. Examples of drilling spindles.

Tables. Recent Machine Tool Developments, Joseph Horner. Eng., vol. 109, nos. 2821 and 2823, Jan. 23 and Feb. 6, 1920, pp. 103-105 and 169-171, 29 figs. Jan. 23: Drilling machine tables, and tables for multiple-spindle machines. Feb. 6: Bed and table for two-spindle drilling and tapping machine for locomotive tube plates.

Tilting Table for. The "Asquith" Patent Universal Tilting Table, H. Bentley. Eng. Production, vol. 1, no. 7, July 1920, pp. 247-248, 5 figs. Details of fixture for handling heavy work, consisting of a strong main axle or pivot, which is adjustable through a complete circle, and which has stops for every 90 deg.; it is operated by hand, but can be electrically operated if desired.

[See also MACHINE TOOLS, Special.]

DRILLS

Pneumatic. Modern Type of Pneumatic Hand Drills (Pressluft-Handbohrmaschine neuerer Bauart), K. Rizor. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 11-12, June 15, 1920, pp. 115-116. Describes machines employed in the main railroad shop at Arnsberg in Westphalia which, it is claimed, greatly accelerate work in boiler shop. Their construction differs from that of usual type in that air acts on pistons which rotate in three adjoining cylinders, the cylinders themselves forming the housing.

The Desoutter Pneumatic Drill. Machy. (Lond.), vol. 16, no. 401, June 3, 1920, pp. 274-275, 14 figs. Machine is said to be of entirely novel design and takes form of cylinder 4 in. long by 1⅝ in. diam., from which chuck protrudes; it weighs 1 lb. 14 oz. and takes drills up to ¼ in.

Rock. See ROCK DRILLS.

Tap. Tap Drills, Clearances and Tolerances, Walter J. Rudolph. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 65-66. Tables of tolerances and clearances.

Twist. Teaching the Proper Use and Care of the Twist Drill by Means of Motion Pictures, J. V. Hunter. Am. Mach., vol. 53, no. 1, July 1, 1920, pp. 11-13, 18 figs. Moving picture which has been put out by large twist-drill producer in order to inform users as to correct methods of handling twist drills.

Twist, Grinding. The Use and Abuse of Twist Drills, H. Wills. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 461-463, 12 figs. Examples of incorrect grinding are given and results are pointed out. Grinding rules are formulated.

Twist-Drill Sharpening and Thinning Machine. Engr., vol. 130, no. 3375, Sept. 3, 1920, pp. 237, 3 figs. Built by Herbert Hunt & Sons, Manchester, England. Machine is said to give accurate and uniform results in hands of unskilled operator.

Twist, High-Speed. Making Forged High-Speed Twist Drills, J. V. Hunter. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 719-722, 11 figs. Methods used by Ketler-Elliott Erection Co., Chicago.

Twist, Manufacture of. The Manufacture of Twist Drills and Taps. Machy. (London), vol. 15, no. 386, Feb. 19, 1920, pp. 641-643, 7 figs. Production methods of Sir W. G. Armstrong, Whitworth & Co., Ltd., Openshaw, Manchester, England.

Twist, Renewing. Renovating Broken Drill-Shanks. Mech. World, vol. 67, no. 1744, June 4, 1920, p. 354, 6 figs. Writer describes method devised and employed by him for renewing twist drills with broken tangs.

DRINKING FOUNTAINS

Portable, Factory. Drinking Water Facilities in Industrial Plants, J. A. Watkins. Safety Eng., vol. 39, no. 2, Feb. 1920, pp. 54-60, 5 figs. Basic requirements which all drinking water systems in industrial plants should fulfill. Description of portable sanitary drinking fountains for use in small plants.

Types and Tests. Final Report of the Committee on Sanitary Drinking Fountains of the Iowa Section of the American Water Works Association. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 33-40. It is concluded from experiments that (1) all types of drinking fountains with vertical jets are to be condemned, (2) most types of drinking fountains with slanting jets are to be condemned and (3) to be sanitary, jets should be slanting and orifices of jets should be perfected in such a manner that they cannot be touched by fingers or lips, or contaminated by droppings from mouth or by splashings from basins beneath orifices.

The Relative Sanitary Values of Different Types of Drinking Fountains, Louis V. Dieter. Am. City, City Edition, vol. 21, nos. 5 and 6, Nov. and Dec. 1919, pp. 452-457 and 549-554, 4 figs. Results of tests of vertical nozzle types and of sloping stream types.

DROP FORGING

Billets for. Billets for Drop Forgers, H. Brearley. Jl. of West of Scotland Iron & Steel Inst., vol. 27, part 6, March 1919-1920, pp. 63-68 and (discussion) pp. 69-72, 30 figs. on 8 supp. plates. Imperfections in billets, their causes and their prevention.

Die Blocks. Analyzes Die Block Requirements, W. C. Peterson. Iron Trade Rev., vol. 67, no. 8, Aug. 19, 1920, pp. 517-519. Standardization of chemical analyses is urged. Squeezing die blocks is considered superior to hammering. Paper read before Am. Drop Forge Assn.

Physical Requirements of Die Blocks, W. C. Peterson. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 297-299. Urges that plan be formulated for correct study of use of die blocks and their attendant failures. Paper read before Am. Drop Forge Assn.

Reasons for Standardizing of Die Blocks, C. B. Porter. Amer. Drop Forger, vol. 6, no. 6, June 1920, pp. 286-287. Urges necessity of standardizing die blocks with respect to their size, the quality of steel used, the method of forging and annealing and the hardening treatments for safe operation. Paper read before Am. Drop Forge Assn.

Die-Room Problems. Reviewing Present Die Room Problems, P. A. Williamson. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 18-19. Suggestions in regard to establishing apprenticeship plan.

Furnaces for. See FURNACES, INDUSTRIAL, Gas-Fired.

Hammer Lubrication. Hammer Lubrication for Drop Forge Plant, R. V. Harty. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 244-246, 8 figs. Review of common practices of lubrication by hydrostatic and individual forced-feed systems. Advantages of central forced-feed system are enumerated.

Machines for. See FORGING, Machines for.

Plants. New Drop Forge Plant at Pittsburgh. Iron Age, vol. 106, no. 5, July 29, 1920, pp. 253-257, 7 figs. Group arrangements of forging sets, furnaces and machine tools, transportation system and employee comfort features, it is said, make for quantity production.

New Drop Forge Shop Built in Northwest. Am. Drop Forger, vol. 6, no. 4, April 1920, pp. 170-174, 7 figs. Attention is called to arrangement which permits of production to travel one way by electric motors, trucks and cranes.

Shipbuilding Application. Drop Forging as Applied to Shipbuilding, Joseph L. Murphy. Am. Drop Forger, vol. 6, no. 3, March 1920, pp. 125-128, 6 figs. Examples of work done in various plants.

Welding. See ELECTRIC WELDING, Drop Forgings.

DROP FORGINGS

Heat Treatment of. The Heat Treatment of Drop Forgings, Leslie Aitchison. Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 107-109, 2 figs. Effect of alloying elements on general characteristics of steel. Paper presented before Association of Drop Forgers, England.

Types. The Anatomy of a Drop Forging, Leslie Aitchison. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 531-538, 12 figs. Points out how drop forgings possess structure of steel ingot and explains different types of forgings.

Welding. See OXY-ACETYLENE WELDING, Drop Forgings.

DROP TABLES

See RAILWAY SHOPS, Drop Tables.

DRY BATTERIES

See BATTERIES.

DRY KILNS

Lumber Control. Graphic Lumber Control and Kiln Progress Board, M. O. Reed. Wood-Worker, vol. 39, no. 5, July 1920, pp. 28-29, 4 figs. Describes method of controlling kiln-drying, independently, where no production control exists, and to link it up with existing systems in cases where this work has already been undertaken.

Operation. Hints on Drykilns and Kiln-Drying, E. N. Angus. Wood-Worker, vol. 38, no. 9, Nov. 1919, pp. 31-32. Importance of humidity control, also circulation; placing of kiln samples; loading and arrangement of trucks; handling partially-dry stock testing lumber; use of recording instruments, etc.

DRYDOCKS

Boston. The Commonwealth Dry Dock at Boston. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 433-436, 3 figs. Overall length is 1200 ft.; width of entrance section is 133 ft. at coping, with sides sloped on one to eight batter, which gives width at elevation of top sill of 120 ft. Depth of 35 ft. at mean low water and 45 ft. at mean high water is obtained at entrance sill.

Caisson Gates for. Lowering a 400-Ton Dock Caisson Gate with Sand Jacks, G. W. Plaisted. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 886-890, 8 figs. Tests on manipulation of sand jacks are said to have led to their use in placing gate to Navy's Puget Sound shipbuilding dock.

Structural Design of Caisson Gates for Dry Docks, Eugene E. Jalmos. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 89-91, 1 fig. Theoretical design, using method of least work with practical application to actual caisson structure.

Calculations. The Static Calculation of Floating Docks and Similar Structures (Die statische Berechnung von Schwimmdocks und ähnlichen Eisenwasserbauten), L. Karner. Eisenbau, vol. 11, no. 1, Jan. 13, 1920, pp. 1-18, 15 figs. Deals with selection of statically determinate main system and statically indeterminate magnitudes; elasticity equations for statically indeterminate magnitudes; general investigation of floating structures with only one group of statically indeterminate magnitudes; grouping of formulæ for the solution of the 5-moment equation for a given manner of loading.

Floating. A 50,000-Ton Floating Dock. Shipbuilder, vol. 22, no. 113, Jan. 1920, pp. 16-23, 5 figs. partly on supp. plate. Dock has overall length of 218 m., clear width of 44.5 m. and draft over keel-blocks of 12 m. Pumping machinery designed to lift vessel of 45,000 tons displacement and 9 m. draft in 3 hr.

Floating Docks and Similar Steel Structures (Schwimmdocks und ahnlich Eisenwasserbauten), L. Karner. Eisenbau, vol. 10, nos. 11 and 12, Nov. and Dec. 1919, pp. 231-239 and 247-262, 36 figs. and vol. 11, no. 2, Jan. 30, 1920, pp. 41-62, 27 figs. Technical and economic principles for design and construction of floating docks and description of several patents; transverse stability of floating docks; constructive development of cross and longitudinal sections; the pontoon dock and the three-part sectional floating dock; principles of the static calculation of floating docks. Results of investigation of floating structures with a main bulkhead, starting from which, at equal distances on each side, are square frames connected with one another by longitudinal frames. Two cases of stress are considered which, it is said, cover all possibilities of stress occurring in general practice.

Floating Dry Docks, G. B. Canaga. Freight Handling & Terminal Eng., vol. 6, no. 1, Jan. 1920, pp. 17-22, 2 figs. Considerations which determine dimensions of floating docks, together with remarks in regard to stresses in them. Reference is made to various 10,000-ton docks now building by Emergency Fleet Corp. Paper read before Soc. Terminal Engrs.

Motors for Operating Floating Dry Docks, William H. Easton. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 794-797, 7 figs. Advantages of electric motors for operating machinery of floating drydocks.

New Floating Dry Dock Built at Mobile. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 214-218, 8 figs. Donnelly-Type 10,000-ton wooden dock added to Pinto Island plant of Alabama Dry Dock and Shipbuilding Co.

Sectional Floating Drydock Made Continuous by Interlocks. Eng. News-Rec., vol. 85, no. 3, July 15, 1920, pp. 109-111, 4 figs. Details of timber structure at Pensacola with longitudinal truss system in wing walls of each of five sections.

The Design of Floating Docks. Public Works of the Navy. Under the Cognizance of the Bureau of Yards and Docks and the Corps of Civil Engineers, U. S. Navy, Bul. no. 31, Apr. 1920, pp. 47-83, 12 figs. Maximum moments are calculated for bulkhead, cross-girders, and side walls. Structure considered consists of single side walls connected by girders which are in turn connected by continuous main bulkhead. Translation of two articles, one published in Zeitschrift für Bauwesen in 1892, and another in Schiffbau of May 8, 1912, latter being amplification and generalization of method outlined in former article.

Graving. New Graving Docks at Portsmouth, Va., Harrison S. Taft. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 647-650, 3 figs. Description of three concrete graving drydocks, built on arch type of construction, at Norfolk Navy Yard.

Morse. The Morse Dry Dock and Repair Plant. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 781-792, 20 figs. Notes on organization methods, welding equipment used for repair work and employees' association established for looking after welfare of men while at their work in shops.

New Orleans. See SHIPYARDS, New Orleans.

Pearl Harbor, Pump Well for. Pearl Harbor Dry Dock Pump Well Large Precast Unit, R. W. Gaylord. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 861-864, 4 figs. Base

of concrete box 96 x 45 ft. in plan and 60 ft. deep cast on float. Upper part poured in attached cofferdam.

Philadelphia Navy Yard. Soft Ground Complicates Dry-Dock Construction, Charles A. Lee. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 748-752, 7 figs. Account of changes made necessary in construction of graving dock being built at Philadelphia Navy Yard by appearances of water-bearing strata which were not indicated in preliminary borings.

Quebec. Champlain Dry Dock for Quebec Harbour, U. Valiquet. Trans. Eng. Inst. of Canada, vol. 32, part 2, Jan. to June 1918, pp. 415-443, 16 figs. Details of new structure.

Wooden, Durability of. A Sixty-Year-Old Floating Dry Dock, Paul H. Macneil. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 178-180, 5 figs. Durability of wooden floating dry dock is said to be proven by Bruce drydock at Pensacola, Fla., which has been in service since before outbreak of Civil War and is still in active operation.

[See also SHIPBUILDING, New Orleans.]

DRYING

Factors in. Some Factors Involved in Drying Operations, Eustace A. Alliott. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 620-623, 8 figs. Graphs showing influence of both initial and final moisture on length of drying and other factors. Constructed from experiments carried out in small jacketed pan 4 ft. in diameter.

Foods. See DEHYDRATION.

Steam Drying Plants. The Graphic Determination of the Heat Content, Vapor Content and Volume of Moist Air (Die graphische Ermittlung des Wärmeinhalts feuchter Luft), K. Kegel. Braunkohle, vol. 18, nos. 46 and 47, Feb. 14 and 21, 1920, pp. 603-607 and 615-620, 7 figs. Gives diagrams with which it is possible without complicated calculations to ascertain all necessary data for estimation of a steam drying plant. As result of investigations certain directions are given for heat saving in lignite briquet factories, which in general apply to other drying plants as well.

Vegetables. Drying in Direct Current vs. Counter-Current from Economic Standpoint (Trocknung im Gleichstrom oder Gegenstrom?), Harald Nehbel. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 9, 13 and 14, Mar. 4 and Apr. 1, 1920, pp. 75-77 and 105-108, 1 fig. It is demonstrated with aid of tabular data that the counter-current method in connection with mechanical drying of agricultural products is inferior to direct-current method and its use is not recommended, and the assertion that drying should be effected only at low temperature under 60 deg. cent. is said to be incorrect, as the temperature of the drying air is dependent upon construction of drying apparatus.

[See also WOOD, Kiln Drying of White Ash; DRY KILNS, Operation.]

DRYING PLANTS

Air Circulation. The Natural Air Circulation in Drying Plants (Die natürliche Luftführung bei Trockenanlagen), M. Hirsch. Gesundheits-Ingenieur, vol. 43, no. 32, Aug. 7, 1920, pp. 373-375, 9 figs. Includes schematic diagram showing entire working process of a drying plant with external heating apparatus, and the course of the air current.

DURALUMIN

Heat Treatment. Heat Treatment of Duralumin, P. D. Merica, R. G. Waltenberg and H. Scott. Sci. Papers of Bur. of Standards, Dept. Commerce, no. 347, Nov. 15, 1919, pp. 271-316, 26 figs. Heat treatment of alloys of duralumin type was investigated and effect observed of variations in heat-treating conditions, such as quenching temperature, temperature of quenching bath, and of aging or tempering, and time of aging upon mechanical properties. Theory of mechanism of hardening of duralumin during aging after quenching from higher temperatures is developed, which is based upon decreasing solubility of compound $CuAl_2$ in solid solution in aluminum with decreasing temperatures from 520 deg. cent. to ordinary temperatures.

Tempering of Various Aluminum Alloys (Contribution a l'etude de la trempe de certains alliages d'aluminium), Léon Guiller, Jean Durand and Jean Galibourg. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 11, Sept. 15, 1919, pp. 508-511. Experimental study of processes which were employed during war for giving various degrees of hardness to duralumin.

The Micro-Mechanism of the Ageing of Duralumin, Zay Jeffries. Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 278-280. Observations concerning heat treatment of duralumin.

Properties. Duralumin, E. Unger and E. Schmidt. Flight, vol. 12, no. 35, Aug. 26, 1920, pp. 993-935, 10 figs. Also Aeronautics, vol. 19, no. 336, Aug. 12, 1920, pp. 135-138, 10 figs.; Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 49-62, 10 figs.; and Aerial Age, vol. 11, no. 23, Aug. 16, 1920, pp. 772-774, 10 figs. Properties and aircraft uses. According to results obtained by various experiments, duralumin has strength of 35 to 40 kg. per sq. mm., elongation of 10 to 15 per cent, stretching strain limit about 28 to 32 kg. per sq. mm., and modulus of elasticity of about 600,000 to 700,000 kg. per sq. mm. Translated from Technische Berichte.

Increasing Use of Alloyed Aluminum as an Engineering Material, G. M. Rollason. Indus. Management, vol. 59, no. 6, June 1920, pp. 456-461, 10 figs. Composition and physical properties of more important aluminum alloys, particularly duralumin.

Light Alloys of Great Strength (Alliages légers à haute résistance), M. Grard. Revue de Métallurgie, vol. 17, no. 4, April 1920, pp. 286-300, 21 figs. Results of test on duralumin. Tests comprised variation of mechanical properties with hardening by hammer and with consecutive heat treatment, and also study of temper in treatment of tempering temperature, and speed of cooling. Abstract of book entitled, "L'Aluminium et ses Alliages," soon to be published by Berger-Levrault.

[See also ALUMINUM, Uses in Electrical Industry.]

DUST

Explosions. Dust Explosions, Ralph B. Chandler. Can. Engr., vol. 38, no. 1, Jan. 1, 1920, pp. 107-108, 1 fig. Account of accident and suggested theory of dust explosions.

See also EXPLOSIONS, Grain-Dust; FIRE PREVENTION, Dust Explosions.

Exhaust System for. Dust Exhaust System at Arizona Copper Co. Mill, M. R. Hull. Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 207-208, 3 figs. Equipment for removing dust.

Health Hazards. Health Hazards of Non-Poisonous Dusts. A Résumé of Some Recent Investigations, Emery R. Hayhurst. Am. Jl. of Public Health, vol. 10, no. 1, Jan. 1920, pp. 60-65. Includes also bibliography of articles in current literature on health hazards of dusts encountered in industry.

Notes on the Final Report of the South African Miners' Phthisis-Prevention Committee, E. M. Weston. Eng. & Min. Jl., vol. 108,

no. 23, Dec. 27, 1919, pp. 944-947. Comparative study of various methods of testing samples of air and discussion of effects of different types of drills on dust production and diffusion.

Precipitation. Cottrell Electrical Precipitation Process in Japan, Ritaro Hirota and Kyoshi Shiga. Eng. & Min. Jl., vol. 108, no. 22, Dec. 13 and 20, 1919, pp. 895-899, 4 figs. Notes specially recovery of dust and obviating of fume.

Electric Precipitation of Solid and Liquid Particles in Gases (Elektrische Ausscheidung von festen und flüssigen Teilchen aus Gasen), R. Dürrer. Stahl und Eisen, vol. 39, no. 47, Nov. 20, 1919, pp. 1423-1430, 17 figs. Details of Cottrell and Möller processes. Application of Cottrell system in various plants.

Removing Solid and Liquid Particles from Gases by Means of Electricity (Elektrische Ausscheidung von festen und flüssigen Teilchen aus Gasen), R. Dürrer. Stahl and Eisen, vol. 39, no. 46, Nov. 13, 1919, pp. 1377-1385, 8 figs. Historical review and description of various types of apparatus used.

Removal from Workrooms. Removal of Dust, Fumes and Gases from Factory Workrooms, Robert Northrup. Safety Eng., vol. 39, no. 1, Jan. 1920, pp. 18-23. Result of investigation in exhaust system installations throughout New York State is said to have shown extreme inefficiency in construction and maintenance. Salient features of specifications and rules for removal of dust.

DYE INDUSTRY

Dangers in. Dangers in the Dyestuff Industry, L. C. Cone. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 33-35. Review of incidental accidents due to inexperience in new industries, with special reference to dyestuff industry. Explosion risks of dyes and intermediates, of high-pressure apparatus and of inflammable vapor mixtures. Paper read before the Eighth Annual Safety Congress.

Hygienic Control. Hygienic Control of the Anilin Dye Industry in Europe, Alice Hamilton. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 1-21. Notes compiled by writer while sent on special mission by U. S. Commissioner of Labor Statistics to examine conditions in European factories in which anilin dyes and dye intermediates are manufactured, particularly measures taken to protect workers against danger of industrial poisoning.

United States. Creation of a New American Industry. Textile World Jl., vol. 58, no. 13, Sept. 25, 1920, pp. 44-80, 22 figs. Development of dye industry in United States, with study of conditions before, during and after the war, and analysis of production of dyestuff intermediates.

The American Dyestuff Industry, Elmer C. Bertolet. Textile World Jl., vol. 58, no. 5, July 31, 1920, pp. 41-43. Answer to question, "What is the status of American dyes?" Comparison of American dyes with formerly imported products.

DYEING

Formic and Oxalic Acids in. Formic and Oxalic Acids in the Dyeing Industry, Launcelot W. Andrews. Chem. Age, vol. 28, no. 5, May 1920, pp. 162-163. Advantages of formic acid are said to be better penetration, more even dyeing, better exhaustion, brighter colors and no increased cost. Gives table of hydrogen ion concentrations for various percentages of acetic and formic acids.

DYES

Azo. New Basic Materials for the Production of Mordant Coloring Azo-Dyes (Ueber neue Ausgangsmaterialien zur Darstellung beizenfärbender Azofarbstoffe), Heinr. Bamberger. Zeitschrift für angewandte Chemie, vol. 33, no. 2, Jan. 6, 1920, p. 8. Writer explains that by reduction with sodium sulphate new derivatives are obtained that serve as valuable basic materials for certain azo-dyes adapted to production of metal compounds.

Bibliography. General Review and Bibliography of Dyeing, P. E. King. Color Trade Jl., vol. 5, no. 6, Dec. 1919, pp. 164-169 and vol. 6, no. 1, Jan. 1920, pp. 18-23. Articles on substantive dyes, colloid solutions and absorption phenomena, which have appeared in technical press, especially in German periodicals. From British Assn. Reports.

Derivatives. Dye Derivatives of 1.3-Dioxy-Isoquinoline [Ueber Farbstoffderivate des 1.3-Dioxy-isochinolins (o-Homophthalimid)], W. Herzog. Berichte der deutschen chemischen Gesellschaft, vol. 53, no. 4, Apr. 17, 1920, pp. 564-567. Account of experiments carried out at the sci. laboratory of the D. F. Pollak Artificial Resin Factory, Vienna.

Fastness Tests. Need of Standard Fastness Tests, W. F. Edwards. Textile World Jl., vol. 54, no. 21, Dec. 27, 1919, pp. 45-47, 1 fig. Suggests method of standardizing fastness.

Hydrocarbons, Nitration of. Nitration of Hydrocarbons, Arthur Hough, Wallace Savage and D. J. Van Marle. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 666-670, 6 figs. Factors influencing velocity of nitration.

Indigo Carmine. Indigo Carmine, J. Merritt Matthews. Color Trade, vol. 6, no. 3, Mar. 1920, pp. 96-99. Describes action of sulphuric acid on indigo and effect of other coloring matters in natural indigo; preparation, properties and reactions of indigo carmine, and effect of oxidizing agents.

Nomenclature. Nomenclature of Dyestuffs, J. Merrit Matthews. Color Trade Jl., vol. 6, no. 1, Jan. 1920, pp. 29-31. Alphabetical list of trade names of various groups of dyes.

Triphenyl-Methane. Recent Theories of the Constitution of the Triphenyl-Methane Dyes (Neuere Ansichten über die Konstitution der Triphenylmethanfarbstoffe), G. Georgievics. Chemiker-Zeitung, vol. 44, no. 6, Jan. 13, 1920, pp. 41-43. Writer claims it has been shown that not all rosaniline dyes are found in uniform condition, and cannot therefore be determined by one and the same formula.

[See also ANILINE; COAL-TAR CHEMICALS.]

DYESTUFFS

Catechu and Gambier. Analysis of Catechu and Gambier, Raffaele Sansone. Color Trade Jl., vol. 6, no. 3, Mar. 1920, pp. 78-79. Describes qualitative tests which can be made to distinguish Catechu from Gambier—two natural dyestuffs which are said to have gained in importance since the war.

Properties of. Chemical and Physical Properties of Dyestuffs, J. Traube and F. Koehler. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 408-411. Experimental study of diffusion of acid and basic dyes in gelatin substances. Translated from Internationale Zeitschrift fuer Physikalish-Chemische Biologie.

DYNAMETER

See TESTING MACHINES, Dynameter.

DYNAMICS

Analytical. On Hamilton's Principle and the Modified Function in Analytical Dynamics, G. H. Livens. Proc. Roy. Soc. of Edinburgh, vol. 39, no. 2, 1918-19, pp. 113-119. Concerning analytical questions involved in derivations of

modified Lagrangian function for dynamical system.

DYNAMITE

Thawing. See EXPLOSIVES, Dynamite.

DYNAMOMETER CARS

Swiss State Railways. Dynamometer Car for Swiss State Railways. Eng., vol. 109, no. 2843, June 25, 1920, pp. 871-874, 13 figs. Car embodies testing laboratory equipped with measuring apparatus and auxiliary recording instruments and devices whereby are met all requirements demanded in different running tests for determining efficiency of locomotives, resistance of trucks or trains of various kinds, and power required for propelling trains on certain lines under different running conditions. Paper read before Ipswich Eng. Soc.

Railway Dynamometer Cars, J. S. Glen Primrose. Engr., vol. 129, no. 3360, May 21, 1920, pp. 534-537, 10 figs., 4 on p. 530. Describes testing car of the Swiss State Railways, which embodies a physical testing laboratory equipped with the most modern instruments, measuring apparatus and auxiliary recording devices. Details of the hydraulic dynamometer, speedometers, ergometer, integrating cylinder indicator, instrument table and recording pens, etc.

DYNAMOMETERS

Commercial. Commercial Dynamometers, P. Field Foster. Mach. World, vol. 66, no. 1714, Nov. 7, 1919, pp. 222, 4 figs. Details of instrument for measuring drawbar pull, also of an accelerometer, largely employed in connection with steam and electric traction and in testing road vehicles. Peculiar feature of this instrument said to be that no correction has to be made for slope when travelling up or down hill.

Hydraulic Brake. See BRAKES, Hydraulic.

Traction, Recording. The Recording Traction Dynamometer and Its Method of Use. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 898-899, 3 figs. Details and illustrations of the Hyatt dynamometer, described as a one-man apparatus consisting of two units, a pressure unit and a recording unit. It is claimed that much valuable information has been obtained in regard to soils and effect of moisture on soils, etc., by use of this apparatus.

[See also DIESEL ENGINES, Testing.]

DYNAMOTORS

See AUTOMOBILES, Dynamotor for; ELECTRIC WELDING, ARC, Dynamotor.

E

EARTH

Crust, Examination of. The Examination of the Earth's Crust and Its Utilization in Mining and Tunneling (Die Durchforschung der Erdrinde und ihre Nutzbarmachung im Berg- und Tiefbau), Richard Ambronn. Zeitschrift für angewandte Chemie, vol. 32, no. 90, Nov. 11, 1919, pp. 353-355. Gives examples of physical investigation methods and discusses application of radioactive measurements, and use of divining rod and similar devices, or the physiological investigation method which latter is said to be as yet undeveloped.

Internal Conditions. Researches at High Temperatures and Pressures, Charles A. Parsons. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 432-438, 8 figs. Possibility of sinking shaft twelve miles deep in earth is discussed. It is proposed to sink such shaft for exploration purposes.

Pressure. Old Earth-Pressure Theories and New Test Results, Charles Terzaghi. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 632-637, 10 figs. It is concluded from technical investigations and results obtained in experimental measurements that earth-pressure against perfectly rigid wall is fairly independent of density of backfilling. Its value for sand is expressed by means of numerical formula.

Rigidity of. The Rigidity of the Earth, A. A. Michelson and Henry G. Gale. Jl. Geology, vol. 27, no. 8, Nov.-Dec. 1919, pp. 585-601, 8 figs. Observations made established that rigidity in N-S and E-W is the same and ratio is 0.690 with probable error of plus or minus 0.004.

Slides. Earth Slides in Winnipeg Aqueduct Construction, Douglas L. McLean. Can. Engr., vol. 37, no. 21, Nov. 20, 1919, pp. 469-471, 7 figs. Bearing tests said to have demonstrated instability of soft, dark clay, analysis of which showed 15 per cent. of moisture and water of combination.

Subsidence of. Springs and Wells as Causes for Earth Depressions. (Quellen und Brunnen als Ursachen von Bodensenkungen), H. Kegel. Braunkohle, vol. 18, no. 51, Mar. 20, 1920, pp. 681-684, 4 figs. Writer points out that such depressions are often unjustly attributed to mines and when occurring in the vicinity of springs and wells, investigation should be made if and to what extent they may be caused by these.

Subsurface Exploration. An Electrodynamic Method of Exploring beneath the Earth's Surface (Eine elektrodynamische Methode zur Erforschung des Erdinnern), Heinrich Löwy. Physikalische Zeitschrift, vol. 20, no. 18, Sept. 15, 1919, pp. 416-420, 4 figs. Account of experiments made by von Helmut Kröncke in Southwest Africa and abstracts of letters received from him. Writer mentions, in conclusion, that Dr. Kröncke, having returned from Africa, maintains his experiments have proven without a doubt that it is possible by means of electric waves to determine presence of water and to measure its depth.

EARTH EXCAVATION

See EXCAVATION, EARTH.

EARTHQUAKES

Effects on Structures. Notes on the Guatemala Earthquakes, and Earthquake-Proof Construction, S. Vilar y Boy. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 4, April 1920, pp. 559-569, 1 fig. Effect of earthquakes on structures determined with reference to transverse load for which damaged or undamaged buildings had been designed. Tests of strength of various tropical woods, establishing relation between brittleness of wood and its durability.

Waves, Propagation of. The Propagation of Earthquake Waves Through the Earth and Connected Problems, C. G. Knott. Proc. Roy. Soc. of Edinburgh, vol. 39, no. 2, 1918-19, pp. 157-208, 9 figs. Determination of laws of propagation of seismic waves based upon method of calculation in which no assumptions are made between velocity of propagation and distance from earth center.

Worldquakes. Worldquakes and Long Waves (Ueber Weltbeben und lange Wellen), K. Mack. Physikalische Zeitschrift, vol. 21, no. 1, Jan. 1, 1920, pp. 7-11, 1 fig. Worldquake is term used to define earthquake of such force that the whole earth surface is shaken. As results of investigations at Holdenheim observatory, a

new definition of worldquake is given; formulæ are presented by which calculation can be made of distance from seat of quake from moments at which waves are recorded in seismogram of a single observation station, and these formulæ are applied for the determination of the seat of worldquake of June 26, 1917.

EARTHWORK

Railway. See RAILWAYS, Embankments.

Shrinkage of. Shrinkage of Loosely Filled Earthwork in Embankments, E. E. R. Tratman. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1256-1260. Distinction between shrinkage and reduction in volume. Varied opinions and few reliable records, it is said, indicate need of study and experiment.

ECHELLITE

Properties of. Echellite, a New Mineral, N. L. Bowen. Am. Mineralogist, vol. 5, no. 1, Jan. 1920, pp. 1-3. It has white color, porcelainlike where fibers are fine and nearly glassy where fibers are coarser. Hardness of needles is about 5. Crystallization is believed to be orthorhombic.

ECONOMICS

Engineering. Some Fundamentals of Engineering Economics, D. B. Rushmore. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 820-824, 1 fig. Writer sketches evolution of present industrial era and draws attention to dependence of industrial prosperity upon "substitution of power driven machinery for physical effort."

ECONOMIZERS

Advantages. Economizers, W. F. Wurster. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June 1920, pp. 323-325, 5 figs. Construction features are explained and advantages pointed out.

Cross-Current. Improvements in the Power and Heat Equipment of Mine Power Plants (Kraft- und wärmetechnische Neuerungen bei der Ausgestaltung von Tagesanlagen), H. Föge. Kali, vol. 14, no. 7, Apr. 1, 1920, pp. 115-122, 7 figs. Discussion of cast-iron and steel economizers with details of a cross-current economizer with water circulation, consisting of a number of rows of horizontal or vertical tubes of seamless steel provided with specially applied gills.

Explosions in. Explosions in Economizers (Ueber Explosionen an Rauchgasvorwärmern), G. v. Doepp. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 51, Dec. 20, 1919, pp. 1281-1287, 7 figs. Account of a number of recent economizer explosions in America and Europe, causing great destruction, together with suggested precautions to be taken to prevent them.

Installation and Use. Practice in the Installation and Use of Economizers. Elec. Rev. (Chicago), vol. 76, no. 16, Apr. 17, 1920, pp. 638-640, 4 figs. Describes two types of economizers and points out advantages and disadvantages of their use. Saving of fuel is said to be accomplished. Points in connection with installation and factors entering into their successful operation.

Preheating Air vs. Recovery of Heat in Chimney Gases and Preheating of Air Récupération de la chaleur dans les fumées et rechauffage de l'air), Emile Prat-Daniel. Chaleur et Industrie, no. 4, July 1920, pp. 241-249, 6 figs. Writer prefers preheating of air to economizers.

Savings Due to. Savings Due to Economizer, R. G. Bohn. Power Plant Eng., vol. 24, no. 7, April 1, 1920, pp. 367-370, 2 figs. Methods of calculating heat transfer, final temperatures and net savings.

Steel Works, Value in. Economizers in Steel Mill Power Plants, J. Lee Larew. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 353-355, 1 fig. Curves showing percentage of heat combustion in flue gases are given, and advisability of installing economizers in steel-mill plants is discussed.

Tube Failures. Some Examples of Economiser Tube Failures, C. E. Stromeyer. Power House, vol. 13, no. 12, June 21, 1920, pp. 282-286, 3 figs. Gives summary of Board of Trade reports dealing with explosions of economizers and causes leading to them.

EDUCATION

Engineering. See EDUCATION, ENGINEERING.

Industrial. See EDUCATION, INDUSTRIAL.

University Extension. The University Extension Movement, W. S. Bittner. Dept. Interior, Bur. Education, Bul., 1919, no. 84, 1920, 124 pp., 4 figs. Notes on relation between English and American movements; war and educational extension; federal division of educational extension established; national association incorporated; essential elements of university extension; institutions pursuing the several activities; extension work in engineering, etc. Notes on State university divisions. List of extension publications.

Vocational. See VOCATIONAL EDUCATION.

EDUCATION, ENGINEERING

Chemical Engineering Course. See ENGINEERS, Chemical.

Coal Mining. The Training of Students in Coal-Mining, with Special Reference to the Scheme of the Engineering Training Organization, F. W. Hardwick. Trans. North England Inst. Min. & Mech. Engrs., vol. 69, part 2, Feb. 1919, pp. 13-20 and (discussion) pp. 20-28. Engineering Training Organization is a British institution formed to serve as central organization for improvement in and better coordination of engineering training.

Coöperative Courses. A Coöperative Course in Electrical Engineering Conducted by Massachusetts Institute of Technology and General Electric Company, W. H. Timbie. Eng. Education, vol. 10, no. 10, June 1920, pp. 459-476. Course covers period of five years, the first two years being identical with the regular course in electrical engineering at the Institute, and the last three years being divided between instruction in theory at the Institute and training in manufacturing methods at General Elec. Co.

Coöperation Between the Preparatory Schools, the Engineering Colleges and Industries as Viewed from the Standpoint of the Educator, Arthur M. Greene, Jr. Eng. Education, vol. 11, no. 1, Sept. 1920, pp. 5-17. Coöperation between schools and colleges, writer says, is to be obtained by more extensive and thorough work in preparatory subjects of mathematics, English and sciences taught in school, and acceptance of this work by colleges. Between college and industry, he believes, coöperation will consist in more thorough and intense training, and special training required for industrial problems.

Linking the Technical School with the Shop, Herbert R. Simonds. Iron Trade Rev., vol. 67, no. 10, Sept. 2, 1920, pp. 646-651, 9 figs. Plan adopted by Mass. Inst. of Technology in coöperation with General Elec. Co.

Coöperative Method. Some Remarks on Coöperative Method of Engineering Education, V. Karapetoff. Eng. Education, vol. 10, no. 3, Nov. 1919, pp. 101-104. Emphasizes that "there is no universal method of education applicable to large group of men, and that the problem is to keep on analyzing each student during his course, giving him such stimuli as he may

need.'' Writer believes that summer vacation would be proper and natural time for practical experience, or whole year taken off before senior year.

Engineering Societies and. Co-Operation Between Engineering Societies and Educators in Standardizing Engineering Education, J. H. Dunlap. Mun. and County Eng., vol. 59, no. 2, Aug. 1920, pp. 59-61. Urges broad standardization of engineering education through coöperation between engineering societies and educators. Paper read before Society for Promotion of Engineering Education.

Heat Engineers, Curriculum for. The ''Heat Engineer'' (''Der Wärmeingenieur''). Braunkohle, vol. 18, no. 37, Dec. 13, 1919, pp. 479-481; Dinglers polytechnisches Jl., vol. 334, no. 26, Dec. 27, 1919, pp. 294-296; and Elektrische Kraftbetriebe u. Bahnen, vol. 17, no. 36, Dec. 24, 1919, pp. 283-284. Notes on curriculum by the Bureau for Economic Control of Fuel and Energy in Steel Works, in Düsseldorf, for the education of ''heat engineers'' or engineers to be employed in large plants or in groups of small plants to aid in the conservation of heat and energy.

Management. See INDUSTRIAL MANAGEMENT, Engineering Students, Training in.

Metallurgical Course for Automobile Field. Metallurgical Courses for Automobile Field, H. B. Dirks. Iron Age, vol. 105, no. 18, April 29, 1920, pp. 1245-1246, 6 figs. Shop courses in foundry, forging, heat treating and similar work established by Michigan Agricultural College.

Production Engineering, Course in. What a Production Engineer Should Know, Alber McDonald. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 185-187. Outlines requirements for course in production engineering.

Professional Spirit in. The Professional Spirit in Engineering Education, C. R. Mann. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1242-1244. Current schooling, it is said, is conspicuously designed to inspire individual to make most of himself for the sake of his own success, while required training must inspire individual to make most of himself for the common good.

Tendencies in. Tendencies in Engineering Education, P. F. Walker. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 445-447. Influences coming as indirect results of war which may cause changes in engineering education are judged to be (1) changed economic conditions affecting both production and marketing of goods, and (2) impending changes in governmental attitude toward and demands on educational institutions.

Thermodynamics, Teaching. See THERMODYNAMICS, Teaching of.

War's Effect on. The Future of Applied Science, C. H. Mitchell. Jl. Eng. Inst. Can., vol. 3, no. 1, Jan. 1920, pp. 1-7. Survey of effect of war on engineering training, the qualities desirable in an engineer, and proposed changes in curriculum of applied science.

[See also ENGINEERS, Education of.]

EDUCATION, INDUSTRIAL

Adult Workman. The Education of the Workingman, W. L. Grant. Queen's Quarterly, vol. 27, no. 2, Oct. 1919, pp. 159-168. How in England and Scotland education of adult workman is being linked up with trained minds of universities. Paper read before College and High School Section of Ontario Educational Assn.

Americanization of Workers. Community Americanization, Fred Clayton Butler. Dept. of Interior, Bul. 1919, no. 76, 82 pp. Handbook for workers prepared under auspices of Bureau of Education, U. S. Dept. of the Interior.

Instructional Factory. Loughborough Technical College Instructional Factory. Foundry Trade Jl., vol. 21, no. 213, Sept. 1919, pp. 630-632, 2 figs. Experience of institution established for giving simultaneously technical instruction and practical training.

Mining. Necessity for a Mining and Industrial Education, H. H. Stoek. Coal Age, vol. 16, no. 21, Nov. 27, and Dec. 4, 1919, pp. 850-852. Purpose and administration of Smith-Hughes act.

University of Cincinnati. Practical Application of Education to Industry, Norman G. Shidle. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1413-1416 and p. 1421, 3 figs. Methods in use at University of Cincinnati.

[See also SCHOOLS, Industrial.]

EINSTEIN'S RELATIVITY THEORY

See GRAVITATION, Einstein's Law; Relativity Theory; RELATIVITY.

EJECTORS

Theory and Design. Water Ejector—Theory and Design, E. J. Laschinger. Jl. South African Instn. Engrs., vol. 18, no. 3, Oct. 1919, pp. 54-58, 2 figs. Including equations which establish radius with regard to quantities, size of jet and throat efficiency expressed in terms of ratio of available head to lift.

ELASTICITY

Relaxation and. Concerning Relaxation (Ueber Relaxation), R. Reiger. Berichte der deutschen physikalischen Gesellschaft, vol. 21, no. 13-14, July 30, 1919, pp. 421-435. It is stated that in connection with the relaxation phenomenon, volume elasticity and shape elasticity are to be considered separately; a relaxation of volume elasticity does not occur in liquids; in the case of plastic and solid bodies it must be experimentally determined whether the variation in density is due to relaxation or not; relaxation of shape elasticity occurs in all cases.

Strain-Energy Function. The Strain-Energy Function and the Elastic Limit, B. P. Haigh. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 158-160, 5 figs. Technical analysis of published experimental determinations of elastic limits of different metals under two- and three-dimensional stresses.

ELECTRIC ARC

Hissing of. Hissing of Electric Arc (Zur Kenntnis der zischenden Lichtbogens), Ernst Bräuer. Physikalische Zeitschrift, vol. 20, no. 18, Sept. 15, 1919, pp. 409-411, 4 figs. Curves are presented based on cinematographic records, which are said to demonstrate that arc, with increasing current strength, burns with increased density and with abnormally high cathodic temperature.

Pressure on Poles of. The Pressure Upon the Poles of the Electric Arc, W. G. Duffield. Philosophical Trans. of Royal Soc. of Lond., series A, vol. 220, pp. 109-136, 22 figs. Experimental evidence is presented in support of (1) existence of pressure upon poles, (2) its variation with arc length and, (3) its variation with current strength. Theory is developed for explaining origin of pressure.

Speaking. The Acoustic Qualities of the Alternating-Current Arc (Ueber die akustischen Eigenschaften des Wechselstromlichtbogens), W. Geyger. Elektrotechnischer Anzeiger, vol. 36, no. 126, Nov. 6, 1919, pp. 598-599, 3 figs. Writer expresses surprise that experiments with the speaking arc have not been undertaken, and claims investigations in this field show that the alternating-current arc can be employed for musical tones and whistling,

though not so well adapted thereto as the continuous-current arc. He describes a method of telegraphing by means of a ray of light from such an arc.

ELECTRIC CABLES

See CABLES, ELECTRIC.

ELECTRIC CIRCUITS

Alternating-Current. See ELECTRIC CIRCUITS, A. C.

Branch, Fuse Protection for. Fuse Protection for Branch Conductors, Henry C. Hortsmann and Victor H. Tousley. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 266-268, 2 figs. Method is suggested for installing branch-line fuses in large industrial plants. Curves for short-time rating of conductors are worked out.

Calculation. Graphic Calculation of Electric Networks (Graphische Berechnung elektrischer Leitungsnetze), A. Schwaiger. Elektrotechnische Zeitschrift, vol. 41, no. 12, Mar. 18, 1920, pp. 227-232, 15 figs. A new method is described, based on construction principles differing from those of the Hochenegg method, application of which covers the same field as the Frick method. Application of method is explained with aid of simple examples followed by calculation of entire networks.

Current Distribution. A Method for the Determination of Voltages and Current Distribution in Closed Networks (Ein Verfahren zur Ermittlung von Spannungen und Stromverteilung in geschlossenen Leitungsnetzen), Karl Jungwirth. Elektrotechnik und Maschinenbau, vol. 37, no. 37, Sept. 14, 1919, pp. 416-420, 10 figs. A graphical method is described for analyzing current distribution in closed networks, and concrete example of method is presented.

Excess Current, Protection Against. The Protection of Electric Distributing Stations Against Excess Current (Ueber den Schutz elektrischer Verteilungsanlagen gegen Ueberströme), J. Biermanns. Elektrotechnische Zeitschrift, vol. 40, nos. 47, 48, 49 and 50, Nov. 20, 27, Dec. 4 and 11, 1919, pp. 593-597, 612-616, 633-637 and 648-653, 30 figs. Based on results of investigations during last few years a theory is worked out of protection against excess current. It is pointed out that disconnecting of a short-circuit does not always protect remaining network from damage, and in many cases checking of short-circuit current must be effected by installation of so-called protection reactance. Writer describes two new relays, one dependent on current and the other on voltage, and shows by means of concrete examples that with the use of suitable connections in many cases these relays offer a perfect solution of the excess-current problem.

Power Capacity of. A New Law for Power Capacity of Electrically Indeterminate Systems (Ein neues Gesetz über die Leisteungsaufnahme elektrisch unbestimmter Systeme), F. Natalis. Elektrotechnische Zeitschrift, vol. 40, no. 50, Dec. 11, 1919, pp. 645-648, 8 figs. It is mentioned that for calculation of indeterminate systems in bridge building Castigliano's rules on deformation work are employed. An analogous law for electrically indeterminate systems is developed and demonstrated with aid of examples. Writer claims this law, dealing with the power capacity of an electric system is a supplement to the Kirchhoff laws dealing with currents and voltages.

Protection. Grounding and Polarization as Protecting Measures—II, W. J. Canada. Elec. Rev. (Chicago), vol. 76, no. 10, Mar. 6, 1920, pp. 391-394. Why and how certain electric circuits should be grounded in order to afford protection against fire and life hazard.

Protective Devices. Automatic Protective Devices for Alternating Current Systems, A. E. McGoll. Elecn., vol. 84, no. 2192, May 21, 1920, pp. 565-567 and (discussion) pp. 567-568, 4 figs. Deals with following protective systems: (1) Leakage protective or core-balance devices either of current, magnetic, or mechanically balanced types; (2) interlocked discriminating devices such as are applied to parallel feeder protection; (3) differential systems, operation of which is based on a difference in quantity or direction of current at each end or side of protected circuit; (4) special cable designs which by their construction partially or wholly function as protective devices; (5) reverse-power devices which operate when power flows in opposite direction to that normally intended; and (6) simple overload devices which operate by excess current. Abstract of paper read before Instn. Elec. Engrs.

Regulation. Inherent Regulation of Continuous Current Circuits, A. L. Ellis and B. W. St. Clair. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 135-142, 13 figs. Discusses voltage changes, inherent in d. c. circuits upon change of load. Means of mitigating their effect is given.

Short-Circuit Calculations. A New Short-Circuit Calculating Table, W. W. Lewis. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 669-671, 5 figs. Rheostats consist of tubular resistance elements with taps brought out and connected to buttons on back of board. On front of board is an etched dial plate calibrated in per cent reactance. Total of 104 rheostats are provided, 20 of these being connected as generators and 84 as lines.

ELECTRIC CIRCUITS, A. C.

Calculation. The Power Capacity of Alternating Current Systems and a Simplified Method of Calculating Them (Die Leistungsaufnahme von Wechselstromsystemen und ein vereinfachter Weg zur Berechnung der letzteren), F. Natalis. Elektrotechnische Zeitschrift, vol. 41, no. 26, June 30, 1920, pp. 505-508, 11 figs. A calculating method is developed, new feature of which is the representation of an inductive resistance through a vector diagram, from which very simple and clear vector equations are evolved, results of which are graphically calculated.

Current Regulation. A Current Limiting Regulator for A. C. Circuits. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 522, 2 figs. Patented in two forms, as transformer and as choke coil. Curves indicate operation of regulator in either case.

An Automatic Current Limiting Regulator for Alternating Circuits. Engineer, vol. 128, no. 3332, Nov. 7, 1919, pp. 470-471, 4 figs. Characteristic curves of clutch designed to transmit definite torque irrespective of slip between two members of clutch.

A Remarkable Property of a Well-Known Alternating-Current Circuit, E. B. Brown. Elecn., vol. 83, no. 2171, Dec. 26, 1919, p. 748, 5 figs. Shunting of choke coil of constant inductance and constant non-inductive resistance is said to diminish current taken from mains.

Electrostatically Coupled. Electrostatically Coupled Circuits, Louis Cohen. Proc. Inst. Radio Engrs., vol. 8, no. 5, Oct. 1920, pp. 434-440. Expressions of secondary frequencies, secondary current, and secondary resonance current of electrostatically coupled circuits.

Oscillatory. On the Period and Decrement of an Oscillatory Electrical Circuit Provided with a Short-Circuited Secondary, Iolo Jones. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 553-565, 8 figs. Mathematical study of effect on period and decrement of oscillation of system, of varying resistance of short-circuited coil.

Protection. Switching and Protection of Transmission Circuits, S. Q. Hayes. Elec. Jl., vol. 17, no. 5, May 1920, pp. 178-188, 29 figs. Deals principally with oil circuit breakers, relay equipment, lightning arresters, station layouts and system arrangement. A few high-voltage transformers used on some of larger systems are described.

The Protection of Alternating-Current Systems Without the Use of Special Conductors, Kenelm Edgcumbe. Jl. Instn. Elec. Engrs., vol. 58, no. 291, May 1920, pp. 391-407 and (discussion) pp. 407-416, 30 figs. Possible schemes.

Reactive Factor. Explanation and Measurement of Reactive Factor, Victor H. Todd. Power, vol. 51, no. 16, Apr. 20, 1920, pp. 620-621, 7 figs. Simplest means of indicating reactive factor of single-phase or polyphase circuit is said to be by a meter, similar to one described, which indicates directly without constants or other calculations, the sine of angle of phase difference between the current and voltage and shows if current is leading or lagging.

Switchboard Meter Connections for. Switchboard Meter Connections for Alternating-Current Circuits, J. C. Group. Elec. Jl., vol. 17, nos. 1 and 6, Jan. and June 1920, pp. 25-30 and 251-253, 19 figs. Jan.: Explains vector diagram and its use with combinations of meters that are most common in present day practice. June: Six-phase circuits.

Three-Phase. The Maximum of Three-Phase Current Output and the Mean Phase (Das Maximum der Drehstromleistung und die mittlere Phase), K. Gruhn. Elektrotechnik u. Maschinenbau, vol. 38, no. 17, Apr. 25, 1920, pp. 189-191, 3 figs. The relation of the actual output to an assumed real maximum output is developed as definition of the mean phase.

Three-Phase, Harmonics in. Third Harmonics in Three-Phase Systems, D. I. Cone. Elec. World, vol. 75, no. 14, April 3, 1920, pp. 780-781, 2 figs. Examples are given to show how triple-harmonic voltages and currents may be calculated and controlled by proper selection and connection of transformers for three-phase lines.

Three-Phase, Unbalanced. Unbalanced Three-Phase Circuits, Waldo V. Lyon. Elec. World, vol. 75, no. 23, June 5, 1920, pp. 1304-1308, 9 figs. Analytical and graphical methods of treating problems arising from operation of three-phase apparatus on unbalanced voltages. Examples are given to illustrate theory.

Voltage Regulation. Automatic Voltage Regulators, Terrell Croft. Natl., vol. 23, no. 2, Nov. 1919, pp. 576-580, 12 figs. Illustrating principle of automatic voltage regulator as applied to small generators, both of a.c. and of d.c. types.

Study of the Different Systems of Regulating Voltage in Alternating Current Circuits (Étude sur les différents systèmes de réglage de la tension des réseaux à courants alternatifs), V. Sylvester. Houille Blanche, vol. 19, no. 43-44, July-Aug. 1920, pp. 142-148, 14 figs. Classification and exposition of the various systems and illustrations of apparatus used.

The Four Fundamental Magnitudes of Line Calculation for Three-Phase Lines with Star Connection of Current-Consuming Apparatus (Die vier Grundgrössen der Leitungsberechnung für Drehstromleitungen bei Sternschaltung der Verbraucher), J. Teichmüller. Electrotechnische Zeitschrift, vol. 40, nos. 46 and 49, Nov. 13 and Dec. 4, 1919, pp. 580-582 and 630-633, 18 figs. Investigations are said to show that action of 3-phase line with star connection to current-consuming apparatus is similar to action of 3-wire line. The relative regulation and relative fluctuation of voltage are determined by a vectorial method described in same manner as in case of delta connections and 3-wire network. Last of series of four articles begun in same journal in 1916 (p. 397).

ELECTRIC CONDUCTORS

Aluminum. See ALUMINUM, Wire Joints.

Flux Distribution. The Skin Effect and Flux Distribution of Conductors in Proximity to Iron Masses, A. Press. Physical Rev., vol. 15, no. 5, May 1920, pp. 450-453, 2 figs. The hitherto accepted method for estimating self-induction of conductors in proximity to iron is disproved, and it is claimed to be more nearly true that internal self-induction flux distribution of a conductor is much the same as in air and that practically it is only external self-induction flux that takes advantage of proximity of iron masses. Comparison of author's and A. B. Field's solution on basis of Arnoldian theory.

Heating of. Electrical Characteristics of Transmission Circuits, Wm. Nesbit. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 515-519. With table indicating heating capacity of 40 deg. rise of bare copper conductors suspended out of doors.

Heating of Electric Conductors and of Electrical Apparatus (Note sur l'échauffement des conducteurs et des appareils électriques), Adr. Curchod. Revue générale de l'Électricité, vol. 7, no. 25, June 19, 1920, pp. 819-821. Equation for equilibrium of temperature in a conductor is analyzed. Its application to numerical cases is simplified by introducing a factor termed coefficient of superficial thermal conductivity which depends on conditions of position of conductor.

Human Body, Conductivity of. The Human Body as Conductor of Electricity (Der Menschliche Körper als Leiter der Elektrizität), M. Gildemeister. Elektrotechnische Zeitschrift, vol. 40, no. 38, Sept. 18, 1919, pp. 463-466, 2 figs. Writer believes that better knowledge of conductivity of body would lead to more efficient safety measures.

See also ELECTROTHERAPY, Principles and Technique.

Iron. The Calculation of the Alternating-Current Resistance of Solid Iron Conductors of Any Given Shape of Cross Section (Die Berechnung des Wechselstromwiderstandes von massiven Eisenleitern beliebiger Querschnittsform), K. Zickler. Elektrotechnik u. Maschinenbau, vol. 38, no. 15, Apr. 11, 1920, pp. 165-170, 7 figs. It is shown that equations derived by author in a previous work for calculation of iron conductors with full circular cross-section, are also applicable to conductors of any shape of cross-section, and based on these equations, others are derived with which it is possible to solve all the problems in connection with solid iron conductors carrying alternating current.

Parallel, Potential Distribution on. Equal Parallel Cylindrical Conductors in Electrical Problems, F. J. W. Whipple. Proc. Roy. Soc., vol. 96, no. A680, Feb. 3, 1920, pp. 465-475, 4 figs. Distribution of charge and potential determined by method of conjugate functions.

Pointed, Discharges from. Electrical Discharges from Pointed Conductors, John Zeleny. Physical Rev., vol. 16, no. 2, Aug. 1920, pp. 102-125, 4 figs. Considerations are given for attributing lag phenomenon in point discharges to presence of non-conducting coating on discharging surfaces which may consist of adhering gas molecules. Both positive and negative point discharges from surfaces made of water, glycerine or methyl alcohol showed lag in starting.

Rain and. Effect Produced by Electricity of Rain on an Insulated Conductor (Sur l'effet produit

par l'électricité de la pluie sur un fil isolé), Albert Baldit. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 20, Nov. 17, 1919, pp. 910-921. Experiments are said to have established that insulated conductor behaves as potential equalizer and it is considered that perturbations which have been reported to take place in consequence of drops of rain depositing on conductor are not due to electricity carried by drops but to alterations during storm of electrical field of earth.

Reduction in Temperature when Insulated. Reduction in the Temperature of a Wire when Covered with Insulation, Alec. B. Eason. Elecn., vol. 85, no. 2205, Aug. 20, 1920, pp. 202-203, 2 figs. Technical reason why wire of less than 5 mm. in diameter will remain cooler when insulated than when bare for flow of same current.

Resistance. Section-Length-Resistance Relations of Conductors, E. B. Merrill. Elec. News, vol. 29, no. 10, May 15, 1920, pp. 30-31, 1 fig. Chart showing interrelation of resistance length and cross-section of various conductors. Arranged for determining resistance of various sizes of wire of principal metals for lengths from 0.01 ft. to 1000 miles.

Resistance and Inductance Formulas. An Integration Method of Deriving the Alternating-Current Resistance and Inductance of Conductors, Harvey L. Curtis. Sci. Papers, Bur. of Standards, no. 374, April 7, 1920, pp. 93-124, 4 figs. Method consists in dividing conductor into infinitesimal filaments by surfaces which coincide with lines of current flow. Magnetic field at any point is sum of magnetic fields of these filaments. Counter e. m. f. in a filament is determined by rate at which magnetic fields of all other filaments cut this filament.

Rubber-Insulated Wire. The Manufacture of Rubber Insulated Wire, W. S. Hart. Ry. Signal Engr., vol. 12, no. 11, Nov. 1919, pp. 395-398, 7 figs. Why thorough mixing and proper ageing of insulation is essential. Detrimental chemical cycle set up by iron rust.

Snow Loads on. Loads Due to Snow and Frost on Overhead Conductors (Les surcharges de neige et de givre sur les conducteurs des lignes aériennes), F. Loppé. Industrie Électrique, vol. 29, no. 662, Jan. 25, 1920, pp. 23-25. Instances are quoted in which it was determined wires carried load due to snow and frost of values up to 1410 grams per linear meter. It is recommended that consideration be given to stresses due to such loads in designed lines for overhead conductors.

The Design of Aerial Networks as Affected by the Mechanical Properties of the Conductors (Le calcul des canalisations aériennes au point de vue des propriétés mécaniques des conducteurs). Revue générale de l'Électricité, vol. 7, no. 1, Jan. 3, 1920, pp. 21-24, 2 figs. Equivalent aluminum and copper wires of equal factor of safety under specified tension and maximum permissible external loads, such as snow loads. From Bulletin de l'Association suisse des Électriciens.

Specifications, British. British Standard Specification for Dimensions of Insulated Annealed Copper Conductors for Electric Power and Light, Including Pressure Tests. British Eng. Standards Assn., no. 7, July 1919, 33 pp. Specification does not deal with composition, quality or durability of insulating material used as dielectric.

Stranded vs. Solid. Stranded vs. Solid Conductors (Litze oder masiver Draht), W. Rogowski. Archiv für Elektrotechnik, vol. 8, no. 8, Nov. 10, 1919, pp. 269-275, 4 figs. Writer refers to Lindemann's discovery that beyond a certain frequency the resistance of a stranded conductor becomes greater than that of a solid wire, and therefore advises discretion in use of strands. Calculation is made of frequency at which the solid conductor becomes preferable to the stranded one.

Substitute-Metal. Substitute Metals in Electrochemical Industries in Germany. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10 and 17, 1919, pp. 740-741, 1 fig. Including graphs showing relative values and usefulness of copper, aluminum, zinc and iron as electrical conductors. Translated from Das Technische Blatt.

ELECTRIC CONTACTS

See CONTACTS.

ELECTRIC COOKING

Advantages of. Electric Cooking, George T. Barrett. Proc. Tri-State Water & Light Assn. of Carolinas and Georgia, June 17 and 18, 1919, pp. 10-20. Advantages of electric range over fuel-burning stoves. Cost of operation of electrical range.

Comparison with Gas. Electricity Loses Cooking Test to Gas, C. W. Pierson. Gas Age, vol. 45, no. 1, Jan. 10, 1920, pp. 53-55, 1 fig. Comparative tests made by Consolidated Gas Co. of New York.

ELECTRIC CURRENTS

Alternating. See ELECTRIC CURRENTS, ALTERNATING.

Amplification in Bunsen Flame. Amplification of Electric Currents in the Bunsen Flame, C. W. Heaps. Physical Rev., vol. 16, no. 3, Sept. 1920, pp. 238-246, 4 figs. Amplification effects are said to occur similar to those in vacuum tubes by use of third electrode placed near lime-coated cathode in flame.

Circular, Equivalent Shell of. A Note on the Equivalent Shell of a Circular Current, Satyendra Ray. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 134-145, 4 figs. Consideration of stress energy leads to conception of system of electromagnetic ring doublets as consisting of two rings spinning round opposite each other and continually threading each other. Spinning is considered as supplying motive power for threading, distance apart between two corresponding portions of two rings pursuing each other depending on velocity. Pole therefore is taken as fundamental physical entity just as electron.

Comparator of. A Dynamometrical Comparator, Edy Velander. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 680-686, 8 figs. Differential dynamometer for accurate comparison of alternating and direct-current strengths.

Direct, Measurement of. A New Method of Measuring Heavy Direct Currents, R. E. Neale. Elec. Rev., (Lond.), vol. 86, no. 2206, Mar. 5, 1920, p. 292, 2 figs. Method depends upon change in choking effect of choking coil fed with alternating current when iron core of coil is magnetized by direct current to be measured as well as by alternating current. Translated from Elektrotechnische Zeitschrift.

Long-Distance Measurement of Direct Currents (Messung starker Gleichströme auf grosse Entfernungen), Ernst Besag. Elektrotechnische Zeitschrift, vol. 40, no. 36, Sept. 4, 1919, pp. 436-437, 3 figs. Description of new method which allows of measuring d. c. of any desired strength over long distances by means of thin test wires.

High Voltages, Losses at. Measurements of Losses at High Voltages (Verlustmessungen bei Hochspannung), Alfred Semm. Archiv für Elektrotechnik, vol. 9, no. 1, Apr. 15, 1920, pp. 30-34, 8 figs. Results of experiments. Report from Nat. Physical-Technical Inst.

ELECTRIC CURRENTS, ALTERNATING

Bridge Measurement. Bridge Methods for Alternating-Current Measurements, D. I. Cone. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 640-647, 18 figs. Résumé of simple methods of utilizing "bridge" networks in alternating-current measurements of impedances and their components of effective resistance, self and mutual inductance and capacitance, and in frequency measurement. Bibliography is appended.

Curves, Analysis of. Alternating-Current Curves and Their Analysis (Ueber Wechselstromkurven und deren Analyse), R. Slaby. Elektrotechnische Zeitschrift, vol. 40, nos. 43 and 44, Oct. 23 and 30, 1919, pp. 535-537 and 551-552, 11 figs. Relations between virtual value of an alternating current and the amplitudes of different partial waves. Example is cited to demonstrate practicability of process.

Distribution in Triphase Resistances. Calculation of Current Distribution in Triphase Resistances Having Star-Connection, with Any Desired Tension and Resistances (Berechnung der Stromverteilung in sterngeschalteten Drehstromwiderständen mit beliebigen Spannungen und Widerständen), W. Schalchlin. Bulletin Association Suisse des Electriciens, vol. 10, no. 11, Nov. 1919, pp. 319-328, 12 figs. Superposition method.

Multiphase, Measurement of. Measurements of Multiphase Currents (Mehrphasenstrommessungen), H. Michalke. Archiv für Elektrotechnik, vol. 8, no. 6-7, Oct. 10, 1919, pp. 205-209, 2 figs. Compares Fröhlich and Friese systems of connection and shows how to determine total output of multiphase current system by means of torsion dynamometer.

Phase Variation. Method for Varying the Phase Angle of a Current Without Changing Its Intensity and Tension (Método para variar el ángulo de fase de una corriente manteniendo constante su intensidad y la tensión), Konrad Simons. Contribución al estudio de las ciencias físicas y matemáticas Universidad Nacional de la Plata, no. 41, Apr. 1919, pp. 75-78, 2 figs. Induction and resistance connected in series and having shunted capacity, capacity and induction being chosen so that intensity is independent of resistance.

Polyphase. New Application of Polyphase Current (Ueber ein neues Anwendungsgebiet des Drehstroms), Gustav W. Meyer. Elektrotechnischer Anzeiger, vol. 36, nos. 42, 44 and 45, May 6, 11 and 13, 1919, pp. 197-198, 203-204, and 209-210, 10 figs. Short review of former attempts to use a. c. in magnetic dressing of ores. It is claimed that rotating field separator, invented by writer, makes possible a magnetic separation even of diamagnetic parts as long as they possess sufficient electric conductivity.

Rectification. Advantages and Disadvantages of the Various Systems of Transforming High-Tension Alternating Current into Direct Current (Advantages et inconvénients des divers systemes de transformation de courant alternatif à haute tension en courant continu), F. Sarrat. Houille Blanche, vol. 19, nos. 41-42 and 43-44, May-June and July-Aug. 1920, pp. 101-106 and 131-141, 3 figs. May-June: Comparison of costs and efficiencies. July-Aug.: Based on records of operation and accidents which have taken in various European electric railway substations.

Artificial Sensitizing of Galena-Metal Rectifying Contact (Sur le contact rectifiant galène-métal. Sensibilisation artificielle et remarques diverses), C. Florisson. Comptes rendus des Séances de l'Académie de Sciences, vol. 171, no. 2, July 12, 1920, pp. 106-108. Sensitization is said to be accomplished by heating galena in sulphur flame.

Two Ways of Rectification of Currents by Galena (Sur deux modes de rectification des courants par les galènes), Paule Collet. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 25, June 21, 1920, pp. 1489-1491. Writer claims to have observed in experiments, (1) that when a small electric current traverses lead sulphite ore introduced in a metallic circuit, there is a positive flow from ore to metal, and (2) that when current is large there is a negative flow.

See also RECTIFIERS.

Short-Circuit, Calculation. Short-Circuit Currents in Large Installations (Le correnti di corto circuito nei grandi impianti), A. Dalla Verde. Elettrotecnica, vol. 7, no. 23, Aug. 15, 1920, pp. 414-423, 14 figs. Phenomena arising in single-phase and polyphase circuits when short circuit occurs are analyzed and reviewed and formulas for computing intensities of short-circuit currents are derived.

Three-Phase from Two-Phase. A New Connection for Transforming Two-Phase into Three-Phase Alternating Currents and Vice Versa (Eine neue Schaltung zur Umformung von Zweiphasen- in Dreiphasen-Wechselstrom und umgekehrt), K. Sachs. Schweiz. Elektrotechnischer Verein Bul., vol. 11, no. 2, Feb. 1920, pp. 23-32, 5 figs.; also Elektrotechnik u. Maschinenbau, vol. 38, no. 10, Mar. 7, 1920, pp. 105-109, 5 figs. Connection is described which differs from Scott system of interlinking two single-phase transformers by means of standard 3-phase transformer. The new arrangement is said to be not only cheaper than the Scott system, but considerably simpler than the Stern and other systems.

Three-Phase Voltage Diagram. The Three-Phase Voltage Diagram (Das allgemeine Dreiphasenspannungsdiagramm), Leopold Fähnrich. Elektrotechnik u. Maschinenbau, vol. 38, no. 14, Apr. 4, 1920, pp. 155-158, 7 figs. Certain auxiliary lines in the voltage diagram are said to determine new voltage vectors which, when multiplied by current of one phase, give direct output, apparent output and the physically determinable part of blind output. New formulæ for output are developed, based on these graphic methods, and their value for optimum calculations is pointed out.

Voltage-Wave Analysis. Voltage Wave Analysis with Indicating Instruments, Leslie Forrect Curtis. Bul. University of Washington, Eng. Experiment Station, no. 8, June 1920, 26 pp., 13 figs. Method for resonating harmonics and measuring their amplitude by means of electrostatic voltmeter in parallel with adjustable condensance.

[See also HARMONIC MEAN.]

ELECTRIC DISCHARGE

Theory of. The Quantum Theory of Electric Discharge, D. N. Mallik and A. B. Das. London, Edinburgh and Dublin Philosophical Mag., vol. 39, no. 230, Feb. 1920, pp. 233-238, 1 fig. Interprets behavior of electric discharge in vacuum-tube in terms of quantum theory.

ELECTRIC DISTRIBUTION

Automatic Protection. The Automatic Protection of Large Electrical Power Distribution Schemes, F. B. Whitaker. Elecn., vol. 85, no. 2204, Aug. 13, 1920, pp. 178-181, 10 figs. Scheme for protecting each conductor from generator to extreme ends of central distribution network.

Central-Station. Electricity as an Industrial Power, Hastings Read. Indus. Australian & Min. Standard, vol. 62, no. 1610, Sept. 18, 1919, pp. 547-559, 19 figs. Western Australian government scheme of distribution from central station.

Industrial Plants. Protecting Industrial Distribu-

tion Lines, R. B. Gerhardt. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 176-178, 4 figs. Laying out distribution system to facilitate sectionalizing—flexibility of supply to secure continuity of service. Determining proper selective operation of relays.

National. National Distribution of Electrical Energy (Une distribution nationale d'énergie électrique), F. Scoumanne. Revue générale de l'Électricité, vol. 6, no. 18, Nov. 1, 1919, pp. 594-608, 4 figs. Discussion of economical advantages and mechanical possibilities of establishing such a system. Question if treated in general without reference to conditions in any particular nation.

Philadelphia. Distributing System of Philadelphia Electric Company (Système distributeur d'énergie de la Philadelphia Electric Company), George P. Roux. Revue générale de l'Électricité, vol. 6, no. 20, Nov. 15, 1919, pp. 675-681, 6 figs. Insists particularly on duties of load dispatcher and describes apparatus by means of which control is affected.

Relay Installations. Checking Differential Relay Installations, Raymond Bailey. Elec. World, vol. 75, no. 8, Feb. 21, 1920, pp. 429-430, 3 figs. Method of avoiding incorrect connections, current transformer with improper ratio, or relay with wrong number of turns, etc., that may cause tripping flux in relay under normal conditions.

Systems. See ELECTRIC DISTRIBUTION SYSTEMS.

[See also CABLES, ELECTRIC; ELECTRIC CIRCUITS; ELECTRIC CONDUCTORS; ELECTRIC POWER; ELECTRIC SWITCHES; ELECTRIC TRANSMISSION LINES; ELECTRICITY SUPPLY; POLES; RELAYS; SUBSTATIONS; SWITCHBOARDS.]

ELECTRIC DISTRIBUTION SYSTEMS

Neutral for D. C. Systems. Grounding the Neutral for D. C. Distribution Systems, W. H. Price. Assn. Iron & Steel Elec. Engrs., Dec. 1919, pp. 9-13 and (discussion) pp. 13-18. Means of providing neutral for d. c. systems.

New System, Seattle. New Distribution System for City of Seattle, J. D. Ross. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 64-67. On account of scattered loads, feeders from substations will operate at 15,000 volts to neutral.

Protection of. The Protection of A. C. Systems Without the Use of Special Conductors, Kenelm Edgcumbe. Elec. Rev. (Lond.), vol. 86, no. 2204, Feb. 20, 1920, pp. 249-250 and (discussion) p. 251, 8 figs. Author believes four cardinal points of protective system to be: (1) Maintenance of continuity of supply; (2) simplicity of apparatus involved; (3) adaptability to existing gear with minimum alterations and flexibility as regards future extensions; and (4) economy in regard to capital sunk in cables, etc. Abstract of paper read before Instn. E. E.

Reconstructing System, Sioux City. Changing Over the Distribution System of Sioux City, C. E. Schutt. Elec. Rev. (Chicago), vol. 65, no. 4, Jan. 24, 1920, pp. 135-138, 6 figs. Work involved abandonment of direct current for lighting and in certain sections of city entire elimination of direct-current service with gradual contraction of direct-current district.

ELECTRIC DRIVE

Blowers. See BLOWERS, Electric Drive for.

Cement Mills. See CEMENT MILLS, Electric Drive.

Lumber Mills. Electrical Drives for Lumber Mills, J. A. Franklin. Power, vol. 51, no. 14, Apr. 6, 1920, pp. 536-540, 6 figs. Factors that have influenced application of electricity to lumber industry are discussed, and sizes and types of motors and methods of driving are summarized in table.

Machine Shops. See MACHINE SHOPS, Electric Drive.

Machine Tools. The Individual Electric Drive of Machine Tools (Der elektrische Einzelantrieb von Werkzeugmaschinen), Gustav W. Meyer. Elektrotechnischer Anzeiger, vol. 36, nos. 141 and 142, Dec. 3 and 4, 1919, pp. 671-672 and 677-678, 2 figs. Points out importance of regulation of driving motor. Notes on push-button control; driving gear of slotters and planers; reversible coupling vs. reversible motor; the Leonard system, etc.

Motor Inspection. Electric Service at Naumkeag Cotton Mills. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 933-936, 8 figs. Methods of inspecting and maintaining installation of 3247 motors.

Paper Mills. Electric Motors for Pulp and Paper Machinery Drives, William H. Easton. Power, vol. 51, no. 15, Apr. 13, 1920, pp. 584-588, 7 figs. Advantages are discussed and characteristics of different types of motors and kind of controllers used on various drives are considered.

See also PAPER MAKING, Electric Drive; PAPER MILLS, Electric Drive.

Petroleum Industry. The Electric Drive in the Petroleum Industry (Die elektrischen Antriebe in der Erdölindustrie), L. Steiner. Petroleum, vol. 15, nos. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13 and 14, Oct. 1, 10, 20, Nov. 1, 20, Dec. 1, 10, 1919, Jan. 1, 10, 20, Feb. 1 and 9, 1920, pp. 9-18, 75-77, 111-114, 152-155, 226-230, 268-271, 315-320, 354-358, 400-403, 445-448, 499-501, 557-559 and 598-599, 79 figs. Advantages of electric drive in oil fields are summarized. Description of various operating methods followed by details of electrical equipment. Statistical data from the Siemens-Schuckert Works are included.

Presses. See PRESSES, Electric Drive for.

Rolling Mills. See ROLLING MILLS, Electrically Driven.

Rubber Mills. Electric Motors for Driving Rubber-Mill Machinery, William H. Easton. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 331-333, 5 figs. Advantages of motor drive are discussed and various types of motors applicable to rubber mills are considered. Direct-current motors are entirely satisfactory, but in general alternating-current types are preferred for a number of reasons.

Selection of Motor. The Influence of the Inertia of Electric Motor Drives on the Attainable Starting Acceleration (Der Einfluss der Massenträgheit elektromotorischer Antriebe auf die erreichbare Anfahrbeschleunigung), Kurt Lubowsky. Elektrotechnische Zeitschrift, vol. 41, no. 15, Apr. 15, 1920, pp. 285-289, 12 figs. It is shown that in the selection of a motor for driving machinery in which heavy masses have to be accelerated, a mechanical optimum is to be considered, beyond which the starting conditions become worse. The influence of speed, efficiency and ratio of length of armature to pole pitch on the mechanical optimum, are examined on the basis of the operating data of a rolling mill drive.

Steel Industry. See STEEL INDUSTRY, Electric Drive.

Steel Works. See STEEL WORKS, Electrically Driven.

Textile Mills. See TEXTILE MILLS, Electric Drive.

Water Works. See WATER WORKS, Electrically Driven.

ELECTRIC FURNACES

Ajax-Northrup. The Ajax-Northrup Electric Furnace, Dudley Willcox. Metal Industry (N. Y.), vol. 18, no. 5, May 1920, pp. 213-216, 7 figs. It is said that there is no necessity in this type for interlinkage of magnetic circuit with electric circuit.

Arc. Automatic Regulation of Electric Arc Furnaces. Elec. Rev. (Chicago), vol. 77, no. 7, Aug. 14, 1920, pp. 243-247, 6 figs. Automatic regulator for controlling electrodes.

Booth. The Booth Rotating Brass Furnace, Carl H. Booth. Can. Machy., vol. 23, no. 6, Feb. 5, 1920, pp. 158-161 and 171, 6 figs.; also in Can. Foundryman, vol. 11, no. 3, March 1920, pp. 70-73, 5 figs. Type of electric brass furnace in which shell is rotated. This is said to result in less zinc through vaporization and longer furnace life.

See also Rotating.

Booth vs. Gas-Fired Crucible. Foundry Test of Rotating Furnace. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 136-137. Account of tests of operation of 250-lb. Booth furnace in comparison with performance of gas-fired crucible.

Brass. Electric Furnace Replaces Crucibles. Iron Age, vol. 104, no. 14, Oct. 2, 1919, pp. 913-916, 6 figs. Illustrating use of electric furnace for melting of ingot copper and brass.

Some Practical Data on Operating Electric Brass Furnaces. Elec. Rev. (Chicago), vol. 76, no. 6, Feb. 7, 1920, pp. 215-218, 4 figs. Data dealing with melting of brass electrically, published by courtesy of H. M. St. John, Detroit Elec. Furnace Co.; and charts showing reliability of electric furnace, melting results with dirty scrap and excess cost of oil-fired furnace as compared with electric furnaces, taken from paper by E. F. Collins, Gen. Elec. Co.

The Evolution of the Electric Brass Furnace, H. M. St. John. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 12, pp. 161-175. Discusses induction, indirect resistance, and arc types of furnaces.

Weeks' Electric Rotating Furnace as Applied to the Brass Foundry Industry, F. J. Ryan. Metal Industry, vol. 17, no. 12, Dec. 1919, pp. 519-521, 3 figs. Enumeration of theoretical advantages of electric furnace over ordinary oil-fired furnace. Paper read before Foundrymen's Convention.

See also Booth; BRASS FOUNDING, Electric-Furnace Melting.

Bureau of Mines Laboratory. The Electric Furnace Laboratory of the Bureau of Mines, Charles D. Grier. Chem. & Metallurgical Eng., vol. 21, no. 11, Oct. 29 and Nov. 5, 1919, pp. 574-576, 4 figs. Transformer and switchboard equipment. It includes two transformers, two duplex induction voltage regulators, three-panel, black marine slate switchboard and busbar system for carrying current from switchboard to furnace room.

Colby. See Induction.

Collins. Collins Electric Furnace for Melting of Metals and Volatile Alloys (Four Collins pour la fusion des métaux et alliages volatils par l'électricité). Génie Civil, vol. 76, no. 3, Jan. 17, 1920, pp. 75-76, 2 figs. Heat is developed in resistance composed of granular matter, coke for instance, interposed between fixed mobile electrodes of convenient form and dimensions.

Control Equipment. Step Induction Regulator for Electric Furnaces, P. B. Short. Elec. Rev. (Chicago), vol. 76, no. 15, Apr. 10, 1920, pp. 607-609, 4 figs. Description and operating features of new control equipment for electric furnaces. Paper before Am. Electrochemical Soc.

Developments in 1919. Electric Furnace Developments During 1919. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 45-46. Notes specially increased application of electric duplexing and formation of Elec. Furnace Assn.

Duplexing With. See Developments in 1919.

Economic Operation. Power Problems From the Standpoint of the Furnace Operator, Wallace G. Berlin. Gen. Meeting Am. Electrochemical Soc., April 8-10, 1920, no. 25, pp. 367-376, 1 fig. Effect of different degrees of fluctuations of current on power bill is considered, dividing latter into "demand" power and "metered" power. Economics of running large furnace slowly or small furnace intensely is considered from these standpoints; also question of running two furnaces in parallel so as to reduce "demand" power, and of using off-peak power.

Electrodes. Electrode Manufacture, Wilfred Hanby. Practical Engr., vol. 60, no. 1705, Oct. 30, 1919, pp. 210-211, 4 figs. Furnace used in England Steel Works, where output of electric steel exceeds 30,000 tons per annum.

Electrodes for Iron and Steel Furnaces, C. G. Vom Baur. Iron Age, vol. 105, no. 24, June 10, 1920, pp. 1653-1654. Comparison of carbon and graphite. Question of metallic electrodes. Cooling collars and carbon consumption.

Manufacture of Carbon Electrodes for Electric Furnace Purposes, Walter L. Morrison. Chem. & Metallurgical Eng., vol. 22, no. 16, Apr. 21, 1920, pp. 741-744. Description of raw materials used and their preparation, calcining furnaces and plant operation in the "rammed process" of manufacturing electrodes for electric furnace purposes, with an outline of practical deductions obtained from experimental data.

New Plant for Making Carbon Electrodes. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 188-190, 4 figs. Details of process.

New Type of Carbon Electrodes for Electric Furnaces (Soderbergs selvbrændende, kontinuerlige Elektroder). Teknisk Ukeblad, vol. 67, no. 25, June 18, 1920, pp. 337-344, 8 figs. System provides for electrodes to be inserted in reinforced steel tubes, which are lengthened by fresh pieces of tubing welded on and filled with carbon as required. Electrode is baked by electric current and sinks slowly into furnace by its own weight, regulated by frictional adjustment.

Radiographic Examination of Carbon Electrodes, Used in Electric Steel Making Furnaces, Robert Hadfield, S. A. Main. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 76-81 and (discussion) pp. 82-88, 8 figs. on 4 supp. plates. Radiographs of electrodes obtained from different makers are presented and interpreted.

Söderberg Continuous Electrodes (Les electrodes continues de Sodebert). Journal du Four electrique, nos. 13 and 14, Aug. 1-15, 1920, pp. 101-103, 4 figs. Description of Norwegian invention.

The Electrodes of Electric Arc Furnaces (Die Electroden der Lichtbogen-Elektrostahlöfen), E. Fr. Russ. Giesserei-Zeitung, vol. 16, no. 23, Dec. 1, 1919, pp. 361-365, 4 figs. Methods for protecting electrodes.

The Söderberg Electrode: First American Installation, J. W. Richards. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 2, pp. 17-24, 3 figs. Description of three-phase installation of Söderberg continuous, self-baking electrodes, 32 in. (80 cm.) in diameter, in operation at Anniston, Ala., since July 2, making ferromanganese. Furnace is 1800 kw. and operation is perfectly continuous as far as electrodes are concerned.

The Söderberg Self-Baking Continuous Elec-

trode, Joseph W. Richards. Gen. Meeting of Am. Electrochem. Soc., Apr. 8-10, 1920, paper no. 1, 15 pp., 2 figs. Unbaked electrode mixture is fed continuously to furnace, mass being baked by heat of furnace in which it is being used, and apparatus is so arranged and worked that operation is practically continuous during life of furnace.

The Söderberg Self-Baking Electrode, Joseph W. Richards. Iron Age, vol. 105, no. 17, Apr. 22, 1920, pp. 1171-1173, 4 figs. Norwegian invention insuring continuous electrode supply to furnace. Describes how mixture is made and advantage of Söderberg electrode. From paper presented before Am. Electrochemical Soc. of Boston.

Electrodes, Automatic Control. Automatic Control of Arc Furnace Electrodes, J. A. Seede. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 593-597, 7 figs. Methods of electrode regulation.

Automatic Regulation of Electrodes for Electric Arc Furnaces (Selbsttätige Elektroden-Regelvorrichtung für Lichtbogen-Elektröfen). Stahl und Eisen, vol. 39, no. 52, Dec. 25, 1919, pp. 1629-1632, 2 figs. List is given of apparatus employed by the German General Electric Co. (A. E. G.) in regulating electrodes, and method of operation is described.

Electrodes, Heat Losses. Heat Losses through Electrodes of a Six-Ton Héroult Furnace, M. R. Wolfe and V. deWysocki. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 9, pp. 65-67, 1 fig. Each electrode was provided with water-cooled ring immediately above its exit through roof of furnace; also with water-cooled connection at varying distances above roof of furnace. Total of 18.5 kw. was found to be absorbed by upper cooling contact holders, and 104.6 kw. in lower water-cooled rings.

Experimental. Electric Furnace for Experimental Work, F. A. J. FitzGerald and Grant C. Moyer. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 769-770, 4 figs. Suggested scheme for small-scale experiments. Paper read before Am. Electrochem. Soc.

Ferranti. See Induction.

Foundries, Uses in. The Importance of the Electric Furnace for Foundry Work (Die Bedeutung des Elektroofens für die Giesserei), Erdmann Kothny. Giesserei-Zeitung, vol. 17, nos. 15 and 16, Aug. 1 and 15, 1920, pp. 241-246 and 259-264, 1 fig. Discussion of the relative merits of the open-hearth and the electric furnace in regard to quality of casting, fuel conservation, etc. Address read before Assn. German Foundrymen.

Frick. See Induction.

Fuel-Fired vs. Relative Thermal Economy of Electric and Fuel-fired Furnaces, E. F. Collins. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 768-773, 5 figs. Data and cost of operation showing superiority of electric furnace.

Gin. See Induction.

Great Britain. Recent Developments of the Electric Furnace in Great Britain, D. F. Campbell. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 224T-226T. On day of Armistice electrical energy, it is said, was being consumed at rate of nearly 300,000,000 kw-hr. per annum for furnace work alone. Electric steel production had then reached total of 200,000 tons per annum.

Greaves-Etchells. Electric Steel Furnaces and Electric Steel, F. J. Cleary. Jl. Am. Soc. Naval Engrs., vol. 32, no. 2, May 1920, pp. 242-310, 16 figs. Special reference is made to steel castings and Greaves-Etchells type of electric furnace. Compilation of information which has appeared in technical papers in United States and England.

Heat-Treating. A Modern Tool Room Heat Treating Plant. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 389-391, 3 figs. Electric furnaces and pyrometers installed at Ft. Wayne shops of Pennsylvania system.

Metallic Resistor Electric Furnaces for Heat Treating Operations, E. F. Collins. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 433-441, 16 figs.; also in Proc. Steel Treating Research Soc. & Jl. Am. Steel Treaters Soc., vol. 2, no. 13, pp. 23-29 and p. 37, 14 figs. Types are described in which heat element consists of bare exceptionally heavy metallic ribbon uniformly distributed over interior of furnace.

New Electric Spring-Treating Furnaces Increase Production. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 22-23, 3 figs. Details of ovens, heated and controlled electrically as used by large Bridgeport spring company.

Nickel Chromium and the Electric Furnace, W. A. Gateward. Proc. Steel Treating Research Soc. & Jl. Am. Steel Treaters Soc., vol. 2, no. 13, pp. 16-17 and p. 37. Electric heat-treating furnaces manufactured by Hoskins Manufacturing Co.

See also STEEL, HEAT TREATMENT OF, Electric Furnaces for.

Heroult. See Secondary Conductors; Steel.

Hjorth. See Induction.

Induction-Type Regulator. Step Induction Regulator for Electric Furnaces, Philip B. Short. Gen. Meeting Am. Electrochemical Soc., Apr. 8-9-10, 1920. Equipment described consists of combination induction-type regulator, selector switch, transfer switch, series transformer, and suitable panel for meters and switches. Illustrations and detailed description are given of equipment recently designed for 20 electric zinc furnaces in Norway.

Industries. Induction Furnaces and Their Application in Iron and Steel Industries (Les fours à induction et leur application dans l'industrie du fer et de l'acier), W. Engelhardt. Houille Blanche, vol. 19, nos. 37-38, 39-40 and 41-42, Jan.-Feb., Mar.-Apr., and May-June 1920, pp. 12-16, 58-61, and 93-101, 46 figs. Jan.-Feb.: Electrical and structural details of following types: Colby, Kjellin, Hjorth, Ferranti, Frick, Schneider, Gin, and Röchling-Rodenhauser. Mar.-Apr.: Kjellin German types. May-June: Description of different types, with data on their power consumption.

Installation. Report of the Electric Furnace Committee, E. T. Moore. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 556-558. Report of Assn. Iron & Steel Elec. Engrs., giving definite recommendation covering installation on furnaces and accessories under special conditions, transformer primary voltage, reactance, and variable of dual voltage.

Iron Foundry. Electric Furnace as an Adjunct to the Cupola, George K. Elliott. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 1012-1014. Although acknowledging cupola to be more efficient and trustworthy furnace for preheating iron up to point of melting and after that performing fusion itself with minimum waste of heat, writer claims that it does not rank high as superheater of molten metal. He explains reasons why he believes electric furnace is ideal supplement to cupola.

Kjellin. See Induction.

Laboratory. See Bureau of Mines Laboratory.

Leads. Resistance and Reactance of Electric Furnace Leads. Elec. Rev. (Chic.), vol. 77, no. 5, July 31, 1920, pp. 157-159, 1 fig. Importance of minimizing loss of pressure in secondary connections between transformer and furnace. Difficulties encountered due to large alternating currents at low voltage.

Lining. See Non-Ferrous Work.

Ludlum. The Ludlum Type of Electric Furnace, W. F. Sutherland. Can. Machy., vol. 23, no. 10. Mar. 4, 1920, pp. 249-251, 3 figs.; also in Can. Foundryman, vol. 11, no. 4, Apr. 1920, pp. 102-104, 3 figs. Description of an electric furnace distinguished by ellipsoidal shape of hearth and by arrangement of 3-phase electrodes in line which is said to insure proper heat distribution.

Luminous Radiation in. Origin of Luminous Radiation Emitted by Vapors in Electric Resistance Furnace (Sur l'origine des radiations lumineuses émises par les vapeurs dans un four électrique à tube de résistance), G. A. Hemsalech. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 23, Dec. 8, 1919, pp. 1092-1095. It is concluded from experiments that spectrum emitted by vapors in interior of electric-resistance furnace is caused by two independent emissions, one being governed by actions of thermal order and other by those of electrical order.

Metal Production in. Production of Industrial Metals in the Electric Furnace (Herstellung von industriell verwertbaren Metallen im Elektroofen), H. Baclesse. Elektrotechnischer Anzeiger, vol. 36, no. 13, 16, 18, Feb. 13, 23, and Mar. 2, 1919, pp. 61-62, 75-76, and 85-86. Tests made were mostly laboratory tests; metals tested were baryum, calcium, beryl, cobalt, nickel, titans, manganese, and chrome.

Motors for. Types of Motors Used for Furnace Operation, C. G. Lewis. Elec. Rev. (Chic.), vol. 77, no. 5, July 31, 1920, p. 159, 2 figs. D. C. motors for moving electrodes offer advantages of dynamic braking. Standard practice in connection with tilting motors.

Nickel Resistors. Deterioration of Nickel Resistors, F. A. J. FitzGerald and Grant C. Moyer. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 4, pp. 31-34. Nickel wire was found unfit as resistor in electric furnace where it was subject to action on sulphur, because then it became brittle. Similar action was found in case of nichrome wire, but effect was not as marked.

Non-Ferrous Work. Electric Furnaces, J. H. Stansbie. Metal Industry (London), vol. 14, no. 24, June 13, 1919, pp. 483-487, 2 figs. Prominence given to use of electric furnaces for non-ferrous work is noted and information presented as to great possibilities of zirconium as refractory for furnace lining. Report of joint meeting of Birmingham Branch of British Foundrymen's Assn. and Birmingham Metallurgical Soc. and Staffordshire Iron & Steel Inst.

Electric Melting in Non-Ferrous Industry, Edwin F. Cone. Iron Age, vol. 105, no. 10, March 4, 1920, pp. 655-656. Statistics of number and type of furnaces in use in United States. According to figures given there are 261 electric furnaces of all types operating.

Melting of Some Non-Ferrous Metals and Their Alloys in Electric Furnace, E. F. Collins. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26 and Dec. 3, 1919, pp. 673-679, 7 figs. Requirements for economic melting.

Open-Hearth vs. See OPEN-HEARTH FURNACES, Electric vs.

Operating Costs. Electric Melting in an Oil Furnace, William J. Reardon. Metal Industry (N. Y.), vol. 18, no. 5, May 1920, pp. 207-212, 4 figs. Comparative cost data of electric, Schwartz and coke pit furnaces are included.

Operating Costs of Electric Furnaces, R. E. Talley. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 41-43, 3 figs. Curve showing cost of energy for operating 200-kw. furnace.

See also Fuel-Fired vs.; OPEN-HEARTH FURNACES, Electric vs.

Operation. Electric Furnace Operating Data, C. H. Reeder. Elec. Rev. (Chic.), vol. 77, no. 5, July 31, 1920, pp. 153-156, 4 figs. Figures are given to show various items of expense involved in melting of steel. Data obtained in plant and from records of Racine Steel Castings Co., Racine, Wis., and represents normal operating performance of the 3.5-ton furnace installed in 1916 and operated since that time.

Power Consumption Data. The Electric Furnace and Its Power Supply, E. A. Wilcox. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 48-51, 2 figs. Data on power consumption in electric furnace operation are presented. Greater coöperation between furnace user and power company is urged.

Progress in 1919. Review of the Electric Furnace Industry. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 161-163, 3 figs. Survey indicates large increase of electric furnaces in United States during 1919, and also emphasizes predominance of arc type of furnace over resistance and induction types.

Reactors for. Reactors for Electric Furnace Circuits, Harry A. Winne. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 589-592, 8 figs. Methods of introducing reactance into furnace circuits.

Regulation. Some Phenomena Observed in Electric Furnace Arcs, J. Kelleher. Gen. Meeting Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 11, pp. 81-86, 3 figs. Experiments at University of Toronto to determine effect of slags of different compositions upon current variation caused by given movement of electrode.

Rennerfelt. Rennerfelt Electric Reverberatory Furnaces, H. A. De Fries. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 280-281, 2 figs. Patent covering generation of electric heat by means of arcs drawn between vertical electrodes and a conducting bed located horizontally within furnace.

Resistance Type. Electric Furnaces of the Resistance Type for Heat Treating, T. F. Baily. Elec. Furnace, vol. 1, no. 45, April-May 1920, pp. 3-5 and 18-19, 6 figs.; also in Proc. Steel Treating Research Soc. & Jl. Am. Steel Treaters Soc., vol. 2, no. 13, pp. 11-15, 6 figs. Survey of types which have been built for heat-treating plants. Paper read before Detroit Chapter of Am. Soc. for Steel Treating.

High Temperature Electric Heat-Treating Furnace, Geo. H. Holden. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 440-444, 11 figs. Electric furnaces of resistor type built with approval of Navy Department to fill out their contract requiring delivery of 5,000,000 of 3-in. and 4-in. gun forgings.

Radiant Resistor Furnace, F. A. J. FitzGerald. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10 and 17, 1919, pp. 737-739, 4 figs.; also in Brass World, vol. 15, no. 12, Dec. 1919, pp. 355-356, 3 figs. For distillation of low-grade or scrap zinc. Best results are said to be obtained with current of approximately 845 amperes at 65 volts. Paper read before Am. Electrochemical Soc.

Röchling-Roderhauser. See Induction.

Rocking. Electric Rocking Furnace of Novel Design, W. F. Sutherland. Can. Machy., vol. 24, no. 4, July 22, 1920, pp. 87-89, 2 figs. Paper describes electric furnace of new design used for melting non-ferrous metal.

Rotary. See Booth.

Rotating. The Booth Electric Rotating Furnace, Carl H. Booth. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 636-638, 4 figs.; also Foundry Trade Jl., vol. 21, no. 213, Sept. 1919, pp. 648-651, 2 figs. Details of manufacture. Paper read before Am. Inst. Chem. Engrs.

Safeguards. Safeguarding Electric Furnace Operation. Elec. Rev. (Chic.), vol. 77, no. 5, July 31, 1920, pp. 160-162, 2 figs. Means of preventing accidents in foundries, with special reference to safety measures in connection with electric furnaces, substations, transformers and other equipment.

Schneider. See Induction.

Secondary Conductors. Secondary Conductors for Electric Furnaces, Edward T. Moore. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 422-427, 12 figs. Remodeling of rocker type Héroult furnaces.

Shaft, Operation of. Problems in Electric Furnace Smelting, F. Holmgren. Elec. World, vol. 75, nos. 4 and 8, Jan. 24 and Feb. 21, 1920, pp. 196-199 and 425-428, 9 figs.; also in Chem. & Metallurgical Eng., vol. 22, no. 4, Jan. 28, 1920, pp. 165-172, 10 figs. Account of investigations made at various installations to determine best arrangement of electrodes, leads, etc., of ultimate relation between electrical and metallurgical phenomena within furnace and of manner of operating furnace to obtain highest output.

Smelting. Electrode-Regulating Devices for Electric Smelting Furnaces (Elektroden-Regulier-vorrichtungen bei elektrischen Schmelzöfen), E. Fr. Russ. Giesserei-Zeitung, vol. 17, nos. 12, 13, 14 and 16, June 15, July 1, 15 and Aug. 15, 1920, pp. 191-193, 210-213, 232-235 and 264-266, 10 figs. Describes various types of automatic electrode regulators for electric arc furnaces constructed by German electrical firms.

Söderberg Electrodes. See Electrodes.

Steel. Heat Content of Steel and Slag from an Electric Furnace, A. M. Kuhlmann and A. D. Spillman. Gen. Meeting of Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 17, pp. 207-210. Calorimetric determinations of heat content of liquid steel and liquid slag from six-ton Héroult steel-casting furnace. Also determinations of heat capacity of solid slag.

Induction Furnaces for Making Steel (Les fours à induction pour la fabrication de l'acier), Jean Escard. Revue Générale de l'Electricité, vol. 6, no. 24, Dec. 13, 1919, pp. 843-860, 33 figs. Characteristics of various types, together with suggestions in regard to their economical operation.

The Direct Connection of Electric Steel Furnaces with Central Stations (Der unmittelbare Anschluss von Elektrostahlöfen an öffentliche Elektrizitätswerke), E. Fr. Russ. Elektrotechnische Zeitschrift, vol. 41, no. 3, Jan. 15, 1920, pp. 45-48, 5 figs. After calling attention to improvements and possibilities of improvements for obtaining a quiet operation of electric arc furnaces, writer divides them into three groups, namely, the radiation furnace, the arc-resistance furnace without additional heating, and the arc and resistance furnace with additional heating, and describes each of these groups.

The Electric Furnace as Applied to Metallurgy, Clarence Jay West. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 35, pp. 461-552. List of magazine references on construction and operation of electric furnace as applied to metallurgy of iron and steel and non-ferrous metals.

The Position of the Electric Furnace in Iron and Steel Metallurgy, Lewis B. Lindemuth. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 39, pp. 611-627. Comparison is made between physical and chemical characteristics and phenomena of four steel-making processes, namely, bessemer, open-hearth, crucible and electric furnace. Undue praise and claims for electric furnace method and process is deprecated, but it is claimed that when properly installed and operated it is metallurgically the best and economically the cheapest.

See also STEEL MANUFACTURE, Electric Furnaces for.

Steel Foundry. Electric Furnace as Melting Mediums, Edwin F. Cone. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1059-1061. Status as of Sept. 1 in non-ferrous and steel industries. Large expansion in former. Proportion used in foundries. Paper read before American Foundrymen's Association.

Energy Consumption in Manufacture of Castings in Electric Furnaces (La consommation d'énergie dans la fabrication des fontes au four électrique), Aimé Coutagne. Révue de Métallurgie, vol. 17, no. 7, July 1920, pp. 450-468, 3 figs. Comparison of theoretical and experimental data. Useful electrothermic effect on electric furnaces. Comparison of thermal efficiencies of electric furnace and blast furnace.

Large Electric Steel Melting Furnaces, Victor Stobie. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 526-528, 4 figs. Observations in regard to wiring diagram and shapes of furnaces, transformers and automatic electrode regulators. Abstract of paper read before Instn. Elec. Engrs.

Modern Electric Furnace Practice in Foundries, W. E. Moore. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 874-876. Comparative operating costs are presented which bring out marked economy of electric furnace processes over converter process of producing liquid steel.

See also Greaves-Etchells.

Temperature Regulator for. A New Automatic Temperature-Regulating Device for Electric Furnaces (Ueber eine neue, selbsttätige Temperaturregelung für elektrische Öfen), Ernst Haagn. Elektrotechnische Zeitschrift, vol. 40, no. 51, Dec. 18, 1919, pp. 670-672, 3 figs. Description of a device for a resistance furnace using the variation of resistance of a heater for the regulation; when the resistance corresponding to a given temperature is reached, the current is cut off for a given period by means of a time switch. Advantages of system are enumerated.

Transformers for. Interlacing Furnace Transformer Busbars, C. B. Gibson. Elec. World, vol. 75, no. 18, May 1, 1920, pp. 991-993, 4 figs. Scheme for interlacing bus bars for three-phase transformer.

Transformer Equipment for Electric Furnaces, C. B. Gibson. Elec. Rev. (Chic.), vol. 77, no. 5, July 31, 1920, pp. 163-166, 5 figs. Ratings of transformers; mechanical forces in windings; construction details; use of reactance coils with furnace installations; features of their construction and application.

Transformers for Electric Furnaces, J. L. Thompson. Elecn., vol. 84, no. 2177, Feb. 6, 1920, pp. 144-146, 1 fig. Curves of approximate weight and price per nominal kilovolt-ampere rated output for single-phase, oil-insulated, water-cooled and oil-insulated, force-cooled furnace transformers with low-pressure range of 1 to 1.31.

Types. Electric Furnaces, J. H. Stansbie. Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 703-707 and (discussion) pp. 707-708. Notes on Stassano, Rennerfelt, Heroult, Girod, Hering "Pinch" and Greaves-Etchells furnaces. Paper read before Birmingham Branch of Instn. British Foundrymen.

Uses. Electric Furnace Progress. Metal Industry (N. Y.), vol. 18, no. 2, Feb. 1920, pp. 65-67. Rapid increase in use of electric furnaces for melting and heating metals is pointed out.

Uses of Electric Furnace in Modern Chemical and Metallurgical Industries (L'électrothermie a haute température dans les industries chimiques et métallurgiques modernes), Jean Escard. Industrie Electrique, vol. 28, no. 656, Oct. 25, 1919, pp. 383-395. Extraction of

metals, notably aluminum copper; preparation of ferroalloys.

Weeks. See Brass.

Wild-Barfield. Wild-Barfield Electric Furnace, Lancelot W. Wild. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 699-700, 2 figs. Furnace consists of refractory lining which is wound with helix of nickel-chrome wire. Case is made of sheet aluminum, with cast-iron stand and cast-iron top and doors. Furnace is manufactured primarily for heat treatment of steel.

Zinc-Ore Smelting. Electric-Resistance Furnace of Large Capacity for Zinc Ores, Charles H. Fulton. Chem. & Metallurgical Eng., vol. 22, nos. 2 and 3, Jan. 14 and 21, 1920, pp. 73-79, 7 figs., 130-135, 4 figs. Details of experimentation work with electric-resistance furnaces of commercial size based on plan of making briquets with zinc ore to be treated and using these briquets as resistors for electric furnace.

[See also BRASS FOUNDING, Electric Melting; CENTRAL STATIONS, Electric-Furnace Load; FERROALLOYS, Electric-Furnace Manufacture; FERROSILICON, Electric-Furnace Manufacture; MANGANESE ORE, Electric Smelting of; ALLOYS, Electrical Melting; Electric Production of; STEEL, Acid Electric-Furnace; STEEL CASTINGS, Electric-Furnace; STEEL, HIGH-SPEED, Electric-Furnace Manufacture; STEEL MANUFACTURE, Electric Furnaces for; STEEL, HEAT TREATMENT OF, Electric Furnaces.]

ELECTRIC GENERATORS

Alternating-Current. See ELECTRIC GENERATORS, A. C.

Armature Slot Wedges. Armature Slot Wedges, F. J. Aimutis. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 524-525, 1 fig. Comparative study of various materials suitable for manufacture of slot wedges.

Brushes. See BRUSHES.

Concrete Parts for. Use of Concrete Instead of Metal for Parts of Generators, C. M. Hackett. Elec. Rev. (Chicago), vol. 65, no. 4, Jan. 24, 1920, pp. 142-143, 5 figs. Also Power Plant Eng., vol. 24, no. 4, Feb. 15, 1920, pp. 235-240, 2 figs. Details of construction of stator frame and thrust bearing supports.

Direct-Current. See ELECTRIC GENERATORS, D. C.

Field-Coil Design. The Designing of Field Coils and Other Windings for Continuous Current Electro-Magnets, William H. Glaser. Model Engr. & Elecn., vol. 42, no. 982, Feb. 19, 1920, pp. 173-177, 3 figs. Writer discusses what he considers to be principal considerations governing design of field coil for dynamo or motor, namely, excitation to be provided; efficiency, safety and bulk of coil; and cost and convenience of construction.

Gas-Engine-Driven. See GAS ENGINES, Generator Drive.

Losses, Measurement of. Measurement of Losses and Efficiency by Temperature Rise of Ventilating Air, Wm. F. Dawson. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 153-161, 9 figs. Two methods are discussed: Measuring average inlet and outlet temperatures and volume of ventilating air, assuming specific weight and heat of air; and measuring average inlet and outlet temperatures, passing discharged air through electric heater of known capacity and measuring average temperature of air from heater.

Predetermination of Dimensions. Predetermination of the General Dimensions of an Electric Machine (Prédétermination des dimensions générales des machines électriques), H. de Pistove. Revue générale de l'Électricité, vol. 7, no. 4, Jan. 24, 1920, pp. 121-125. Rules are given for computing dimensions of a machine from known dimensions of other similar machines of different power and voltage.

Synchronous. See also Field Leakage.

Temperature Detectors. Embedded Temperature Detectors in Large Generators, F. D. Newbury and C. J. Fechheimer. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 410-418, 11 figs. Tests with armature model. Method of installing detector.

Tooth Reluctance, Calculation. The Calculation of Tooth Reluctance: A Suggested Improvement of Hird's Method, S. Neville. Jl. Inst. Elec. Engrs., vol. 58, no. 286, Dec. 1919, pp. 61, 63, 2 figs. For case of highly tapered or for saturated teeth.

Turbo-Generators. See TURBO-GENERATORS.

Waste-Heat, Utilization of. Utilization of the Waste Heat of Electric Generators (Ausnutzung der Abwärme elektrischer Generatoren), Alfred Reichelt. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, no. 24, June 11, 1920, p. 177. In large electric power plants a large amount of heat is removed from the generators by the air circulated through them for cooling purposes, and writer describes how this preheated air could be supplied to furnaces in place of cold air.

Wind-Driven. See WINDMILLS, Generator Drive.

[See also ELECTRICAL MACHINERY, Brushes; Design.]

ELECTRIC GENERATORS, A. C.

Acoustic. An Improved Acoustic Alternating-Current Generator (Ein verbesserte akustischer Wechselstromerzeuger), M. Gildemeister. Elektrotechnische Zeitschrift, vol. 41, no. 5, Jan. 29, p. 91, 1 fig. Description of generator, or microphone buzzer whose coupling between microphone and telephone is effected by means of acoustics.

Automatic Excitation. Alternating-Current Automatic Excitation by Direct-Current Generators (Ueber Wechselstromselbsterregung von Gleichstrommaschinen), Fr. Leyerer. Archiv für Elektrotechnik, vol. 9, nos. 2-3, July 8, 1920, pp. 95-114, 10 figs. Refers to phenomena in connection with experiments on a large three-phase turbo-generator at the Siemens-Schuckert Works and makes calculations in order to determine conditions governing same; the theoretically developed results are then compared with results of experiments.

Bearings. Spring Thrust Bearings and Cooling Coils on the Large Vertical Generators at Cedar Rapids Power Station, T. W. Gordon. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 840-842. Bearings were designed to specification requiring them to be capable of sustaining maximum load of 600,000 lb. continuously at normal speed of 55.6 r.p.m., temperature of oil not to exceed 45 deg. cent. when water is supplied at 25 deg. cent. They are said to have now been in operation for sufficient length of time to demonstrate their success.

Cascade Arrangement. Cascade Arrangement of Three-Phase Generators and Motors (Kaskadenschaltung von Drehfeldmaschinen), J. Kozisek. Elektrotechnische Zeitschrift, vol. 41, no. 23, June 10, 1920, pp. 445-448, 12 figs. A graphic method for treatment of such arrangement is developed which renders it possible to easily obtain information on most important quantities and properties of the cascade. Method is said to be especially useful in treatment of commutator cascade with three-phase shunt motors.

Change of Frequency. Changing 33-Cycle Apparatus to Operate on 60-Cycle Circuits, D. W. Proebstel and E. H. Le Tourneau. Jl. Am.

Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 238-243, 11 figs. Method of changing two-pole 7500-kw. 1980-r.p.m. 33-cycle, 5500-volt generator from 33- to 60-cycle machine was to change polarity of one of two field poles, making both of same polarity and causing two poles of opposite polarity to be induced at 90 deg. to wound poles, and to reduce speed of machine from 1980 to 1800 r.p.m.

Characteristics. Characteristics of Alternators (Remarques sur les caractéristiques d'alternateurs), M. Doligez. Bulletin de la Société Française Électriciens, vol. 9, no. 82, July 1919, pp. 485-498, 6 figs. Study of characteristic surface $f(U, I, J, \phi) = 0$ for given ϕ.

Concrete Parts. Concrete Parts for Generators, C. M. Hackett. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 843-845, 5 figs. Suggests use of concrete for stator frame and bearing supports of large alternating-current generators and calls attention to special features to be looked after in design and installation of such concrete structures.

Cooling. Temperatures in Large Alternating Current Generators, W. J. Foster. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 547-548. Calls attention to advantages resulting from drawing air into two ends of generator directly from dynamo room and piping it away in connection with hydraulic units.

Design. Early Days in Alternator Design, W. J. Foster. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 80-90, 22 figs. Evolution of alternator is traced from Prof. Thomson's early experimental machines through first commercial machines of Thomson-Houston Co. and monocyclic generators of Steinmetz to early polyphase generators built between years 1894 and 1900. Remarks are made in explanation of great range of frequencies that were to be found in early days.

Factors Determining Generator Design, F. D. Newbury, R. B. Williamson and W. J. Foster. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 779-783, 8 figs. Principal dimensions and weights of 32,500-kva., 12,000-volt, three-phase, 25-cycle, 150-r.p.m., Westinghouse waterwheel-driven generators installed in new 100,000-hp. extension of Niagara Falls Co.

See also Waterwheel-Driven.

Dissimilar. Oscillating Frequency of Two Dissimilar Synchronous Machines, R. E. Doherty. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 125-129, 2 figs. Avoidance of "hunting" in parallel operation of two dissimilar alternators.

Drive for. Turbine-Driven Versus Engine-Driven Alternators, S. H. Mortensen. Power, vol. 51, nos. 9, 11 and 12, Mar. 2, 16 and 23, 1920, pp. 330-333, 425-427 and 469-471, 18 figs. Comparison of construction and operation of rotor of the two types. Features of stator construction and generator operation are compared, covering insulation, operating temperatures, voltage regulation, synchronizing, parallel operation, etc. Notes on quantity of air required, velocity through ducts, layout of ventilating system, temperature limits and means of measuring coil temperatures.

Eddy-Current Losses. Eddy Current Losses and Temperatures of Stator Coils in Alternating-Current Generators, S. L. Henderson. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 418-422, 7 figs. Applications for formulæ derived by R. E. Gilman in his paper on "Theory of Eddy Current Losses in Armature Conductors," presented before Am. Inst. Elec. Engrs.

Excitation. Connected Load Versus Generator Capacity, Fraser Jeffrey. Power, vol. 52, no. 5, Aug. 3, 1920, pp. 162-164, 5 figs. Limitations to field excitation are discussed, with special reference to starting periods of squirrel-cage induction motors.

See also Automatic Excitation.

Field Leakage. Field Leakage in Synchronous Machines, Theo. Schou. Elec. Rev. (Chicago), vol. 77, no. 8, Aug. 21, 1920, pp. 281-284, 5 figs. Method of analyzing and determining field leakage between poles of low- and high-speed synchronous machines.

Heating of. Heating of Alternators and Asynchronous Motors (Échauffement des alternateurs et des moteurs asynchrones), M. Barin-golz. Industrie Électrique, vol. 28, nos. 658, 659 and 660, Nov. 25, Dec. 10 and 25, 1919, pp. 436-438, 451-453 and 467-471, 4 figs. Nov. 25: Formulæ for calculating mean temperature. Dec. 10: Formula for calculation of temperature developed in iron of armature. Dec. 25: Illustrates calculation of heat developed in copper of induction coils.

Induction, Uses of. Induction Generators (Asynchrongeneratoren), Oscar Spitzer. Elektrotechnik und Maschinenbau, vol. 37, no. 38, Sept. 21, 1919, pp. 425-428, 4 figs. Opinion is expressed that in amalgamation of many plants of different size, difficulties of parallel running can be diminished by employment of induction generators in the smaller auxiliary plants. As a disadvantage, however, is mentioned the loading of central stations with idle current, and factors are pointed out on which increased stress of the synchronous machines with parallel-running induction generators depends.

Induction vs. Synchronous. Overestimating and Underestimating the Importance of the Power Factor (Die Bedeutung des Leistungsfaktor. Ueberschätzung und Unterschätzung), E. Rosenberg. Elektrotechnik und Maschinenbau, vol. 37, no. 32, Aug. 10, 1919, pp. 353-357. Writer believes that occasions when use of an induction generator is justified are rare in Central European power plants and in most cases, especially where the load is inductive, the current generated from a synchronous generator is of far greater value.

Line Capacity, Effect of. The Behavior of Alternating-Current Generators When Charging a Transmission Line, W. O. Morse. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 109-112, 2 figs. Discusses effect of transmission-line capacity on behavior of a.c. generators. Diagram is also given showing effect of negative field excitation.

Lubrication. Vertical-Shaft Waterwheel-Driven Alternators—Lubricating System and Rotor, S. H. Mortensen. Power, vol. 51, no. 21, May 25, 1920, pp. 837-839, 5 figs. Typical systems used to lubricate various bearings of vertical alternator; influence of flywheel effect on speed variation and dimensions of rotor; safe speeds and different rotor constructions.

Magnetic Attraction. Calculation of Magnetic Attraction in Dynamo-Electric Machines in Cases Where Maxwell Law Is Not Applicable (Calcul de l'attraction magnétique dans les machines dynamo-électriques lorsque lal oi de Maxwell devient insuffisante), Th. Lehmann. Revue générale de l'Electricité, vol. 6, no. 23, Dec. 6, 1919, pp. 802-811, 4 figs. Study of cases of machine with projecting poles, turbo-dynamo with cylindrical inductors and asynchronous machine.

Manufacture. Construction of Alternating-Current Generators—II, S. L. Henderson. Elec. Rev. (Chicago), vol. 77, no. 14, Oct. 2, 1920, pp. 517-522, 12 figs. Parallel and radial slot rotor design and construction; turbo-generators for single-phase, unbalanced loads.

Parallel Operation. Modern Arrangements and Connections for the Parallel Operation of Electric Generators and Other Machines (Neuere Einrichtungen für den Parallelbetrieb elektrischer Maschinen oder dgl.), W. Wolf. Elektrotechnischer Anzeiger, vol. 37, nos. 57-58, 59-60, 64, 65 and 66, Apr. 10, 14, 21, 22 and

24, 1920, pp. 243-244, 251-252, 271-272, 275-278 and 281-282, 28 figs. Details of a number of devices and arrangements by leading firms for practically eliminating oscillations and other disturbances occurring in machines operating in parallel.

The Parallel Operation of Alternating-Current Generators (Der Parallelbetrieb von Wechselstrommaschinen), F. Niethammer. Elektrotechnik und Maschinenbau, vol. 37, no. 31, Aug. 3, 1919, pp. 341-344. The writer agrees with Benischke that the free or natural vibrations of coupled systems have entirely different frequencies from the systems from which they are built up, and the same is said to be true of a primary and secondary transformer with capacity load. Figures showing frequencies are given.

Radio-Frequency. Radio Frequency Alternators, Marius Latour. Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 220-237, 18 figs. Types of radio-frequency alternators, with special reference to those most used in France at present. Translated from Bul. de la Société Française des Electriciens.

The Nauen 400-Kw. High-Frequency Generator Transmitter [Der Hochfrequenzmaschinen-Sender (400 MK) Nauen], H. Thurn. Telegraphen- und Fernsprech-Technik, vol. 8, no. 9, Dec. 1919, pp. 140-142, 5 figs. Inductor-type high-frequency generator consisting of a massive rotor without rotating winding and slip rings, delivering single-phase alternating current of 6000 cycles, which, by means of a pair of Joly type frequency changers, can be increased to 24,000 cycles.

Remotely Controlled. Remotely Controlled Hydroelectric Synchronous Generators, Charles H. Tallant. Jl. Electricity, vol. 44, no. 9, May 1, 1920, pp. 432-433, 3 figs. Automatic installation at Ontario, Cal., by Ontario Power Co. Equipment consists of one single Pelton impulse turbine, overhung from Westinghouse 500-kva., 50-cycle generator. Plant is controlled with double-throw switch from another plant situated three and one-half miles down canyon.

Rotor Mounting. Experience of an Erecting Engineer—Pressing Alternator's Rotor on Shaft, Kenneth A. Reed. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 768-770, 2 figs. How shaft 0.025 in. oversize was pressed in hub of a. c. generator's rotor with inadequate equipment for doing work.

Short-Circuit Tests. Short-Circuit Tests on a 10,000-kva. Turbine Alternator, E. S. Henningsen. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 214-221, 11 figs. Tests were conducted under different conditions of short circuit, with various arrangements of reactors in circuit and with no reactors in circuit. Empirical expressions are formulated, from results of tests, for effective symmetrical initial short-circuit current of turbine generator and percentage sychronous reactance. Relation is established that for practical purposes per cent leakage reactance may be considered as varying inversely with voltage.

Sine-Wave Testing Sets. Sine Wave Testing Sets, E. J. Burnham. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 177-180, 10 figs. Generator designed to produce accurate sine wave under different load conditions. Large number of stator and rotor slots is used and also cylindrical rotor on which exciting coils are displaced in phase.

Small. Belted Alternating-Current Generators, A. L. Hadley. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 171-176, 13 figs. Principal features in construction of line of small alternators ranging from 37½ kva. to 300 kva.

Synchronous. Behavior of Synchronous Machines on Short-Circuiting Line Sections (Das Verhalten der Synchron-Maschine beim Kurzschluss über Streckenwiderstände), J. Biermanns. Archiv für Elektrotechnik, vol. 8, no. 8, Nov. 10, 1919, pp. 275-295, 9 figs. Results of investigations for calculation of excess current due to short-circuiting. Notes on differential equations of problem, solution for stationary condition, effect of iron saturation, single-phase short-circuit, voltage at terminal of machine shortly after interruption, effect of normal load, etc.

Some Mechanical Features of Synchronous Machines, A. P. Wood. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 130-135, 11 figs. Illustrations are given of improvements which have been made in design and construction by introduction of arc welding and spot welding. Descriptions are included of oil starting system and oil circulating system, coreless and cored box type of stator frame, and rotor spiders of various types and speeds.

The Asynchronous Starting Moment of the Synchronous Generator (Das asynchrone Anlaufmoment der Synchronmaschine), Ludwig Dreyfus. Archiv für Elektrotechnik, vol. 9, nos. 2-3, July 8, 1920, pp. 35-94, 41 figs. Results of investigations show that the synchronous machine can develop a high starting moment if it is properly dimensioned in all parts; a properly designed damping winding is always superior to a short-circuiting ring of solid metal; a standard construction of synchronous machines with solid poles and yokes is not feasible for achievement of a high starting moment. Probable compromise is suggested.

Temperature Indicators for. Temperature Indicators for Alternators, S. L. Henderson. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 188-191, 11 figs. Notes on their construction and application.

Testing. Methods for Testing Asynchronous Machines (Perfectionnement aux méthodes d'essai des machines asynchrones), J. le Monier. Revue générale de l'Électricité, vol. 6, no. 16, Oct. 18, 1919, pp. 499-500, 2 figs. How to prevent errors resulting from difference of frequency used in tests as compared with normal frequency of machine.

Turbo-Alternators. See TURBO-ALTERNATORS.

Turbo-Generators. See TURBO-GENERATORS.

Voltage Regulation. How Power Factor Affects the Voltage Regulation of an Alternator, Quinten Graham. Power, vol. 51, no. 10, Mar. 9, 1920, pp. 379-380, 7 figs. Explains how load having a lagging power factor tends to decrease voltage of an alternating-current generator, where a leading power factor load tends to increase voltage.

Voltage Transformation. Transforming 600-kva. Alternator from 500 to 220 Volts (Transformation d'un alternateur de 600 kva. de 500 volts a 220 volts), Léon Depierris. Electrician, vol. 50, no. 1246, Feb. 15, 1920, pp. 49-54, 10 figs. Instance is related in which transformation was effected by connecting coils in ten groups of two coils in series on each phase.

Waterwheel-Driven. A Unique Design of Waterwheel-Driven Alternator, A. E. Glass. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 166-170, 4 figs. Alternator described is one of three which are being built to operate in a power house hewed out of solid rock of a mountain in Norway. Conditions which prevail have necessitated adoption of generating units with specially-designed system of ventilation and capable of withstanding overspeed of from 80 to 100 per cent.

Designs of Large Vertical Alternating-Current Waterwheel-Driven Generators, M. C. Olson. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 833-839, 11 figs. Writer points out special features that have to be considered in mechanical and electrical design of large hydroelectric generators. References to machines

that are being constructed in sizes up to 32,500 kva. capacity are made and opinion is expressed that there is no insurmountable difficulty in building much larger units.

Large Horizontal Alternating-Current Waterwheel-Driven Generators and Synchronous Condensers, M. C. Olson. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 147-152, 12 figs. One of machines described is a 30,000 kva., 6600-volt, 50-cycle, 10-pole, 600-r.p.m capacity condenser which, it is said, will be capable of operating at 20,000-kva. lagging.

Vertical-Shaft Waterwheel-Driven Alternators, S. H. Mortensen. Power, vol. 51, nos. 18 and 24, May 4 and June 15, 1920, pp. 698-700 and 953-954, 3 figs. May 4: Structural details of several large units, special 32,500-kva. machine, said to be largest hydroelectric unit in the world. June 15: Brakes operated by hand and compressed air, ventilation of alternators and excitation with direct-connected and independent exciters.

Windings. "Fractional Ratio" Windings of Alternators and Their Design (Die Bruchwicklungen (Teillochwicklungen) und ihr Entwurf), Rudolf Richter. Archiv für Elektrotechnik, vol. 8, nos. 6-7, Oct. 10, 1919, pp. 214-268, 26 figs. Discusses fractional-ratio windings in which all slots are filled, as well as those with numerous unfilled slots. Tables of two- and three-phase windings are presented.

[See also ELECTRIC GENERATORS; ELECTRICAL MACHINERY, Eddy Currents in Stator Windings; THERMIONIC VALVES, A. C. Generation; TURBO-GENERATORS.]

ELECTRIC GENERATORS, D. C.

Automobile. The Third Brush Regulation in Automobile Generators, T. R. Knowles. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1300-1301 and 1367, 13 figs. Gives theory from which following operating points are deduced: (1) Poor connection in charging line increases amperes output; (2) increasing main brush or third brush width decreases amperes output; (3) setting third brush to give higher output than normal is dangerous; (4) setting main brushes ahead of manufacturer's position is dangerous; (5) setting main brushes back of neutral is dangerous; (6) setting brushes on neutral by finding position of "no rotation" with only armature current flowing, is correct only with generators having symmetrical pole faces.

Commutators. See COMMUTATORS.

Dynamo Design. On the Fundamental Basis of Dynamo Electric Machine Design (in Japanese), T. Tanaka. Denki Gakkwai Zasshi, no. 381, Apr. 10, 1920. Paper read before meeting of Kwansai Local Section of Japanese Electrical Society.

Flash-Over, Prevention of. Flash-Over in Direct Current Machines and Its Prevention (Das Rundfeuer bei Gleichstrommaschinen und seine Verhütung), E. Cramer. Elektrotechnische Zeitschrift, vol. 40, no. 41, Oct. 9, 1919, pp. 506-508. Causes for flashover. Brush-sparking in thrust load and short circuit; danger of short circuit in different types of converters.

High-Voltage. The Operation and Stress of Direct-Current High-Voltage Generators in the Operation of Radio Transmitters (Ueber die Arbeitsweise und Beanspruchung von Gleichstrom-Hochspannungsmaschinen beim Betrieb von Funkensendern), Karl Wagner. Elektrotechnische Zeitschrift, vol. 41, nos. 30 and 31, July 29 and Aug. 5, 1920, pp. 581-585 and 605-609, 20 figs. Theoretical and experimental investigation of the occurrences in a d. c. generator for 10,000 volts in the operation of a radio transmitter with rotating spark gap, results of which show that the insulation of generator is stressed by resonance phenomena, traveling waves and by phenomena in connection with transmission interruption. Shows how resonance excess voltage can be entirely eliminated, the circuit-breaking excess voltages considerably reduced, and the traveling waves greatly damped.

Pole-Face Leakage. The Calculation of the Pole-Face Leakage of Direct-Current Armatures for the Determination of the Commutation Voltage (Die Berechnung der Stirnstreuung von Gleichstromankern für die Ermittlung der Stromwendespannung), Franz Unger. Elektrotechnische Zeitschrift, vol. 41, no. 32, Aug. 12, 1920, pp. 627-630, 8 figs. Gives equations for calculating leakage conductivity per cm. length of conductor.

[See also COMMUTATORS; ELECTRICAL MACHINERY; ELECTRIC WELDING, ARC, Generators for.]

ELECTRIC HEATING

See HEATING, ELECTRIC.

ELECTRIC INSTALLATIONS

Protection against Excess Voltage. Protection of Electric Installations against Excess Voltage (La protection des installations électriques contre les surtensions), Jacques Damien. Revue générale de l'Électricité, vol. 7, no. 9, Feb. 28, 1920, pp. 293-297, 2 figs. Exposition of principles underlying methods of protecting installations against (1) excess voltages of origin external to network and (2) excess voltages which may develop internally in network. Question is discussed in general.

ELECTRIC LAMPS, ARC

Automatic. Automatic Arc Lamp, Theodore Hall. Sperryscope, vol. 2, no. 2, June 1920, pp. 1-4, 4 figs. Lamp of concentrated flame type for motion picture projection.

Cadmium-Vapor. A New Cadmium-Vapor Arc Lamp, Frederick Bates. Sci. Papers, Bur. of Standards, no. 371, April 10, 1920, pp. 47-50, 2 figs.; also in Lond., Edinburgh and Dublin Philosophical Mag. & Jl. of Sci., vol. 39, no. 231, March 1920, pp. 353-358, 2 figs. Alloying cadmium with gallium is reported to have overcome continued breakage of the Sand cadmium-vapor arc lamp.

Intrinsic Brilliancy of Positive Crater. The Intrinsic Brilliancy of the Positive Crater (Die Flächenhelligkeit des positiven Kraters), E. Podszus. Berichte der deutschen physikalischen Gesellschaft, vol. 21, nos. 11-12, June 30, 1919, pp. 284-293. Writer claims former experiments for determination of the intrinsic brilliancy of the positive crater of pure carbon showed a positive measurable dependence of same on intensity of current and that sublimation point of the carbon is considerably higher than heretofore regarded. Description and result of experiments carried out partly in laboratory of firm of Siemens & Halske, in which two methods were employed, one with a suitable Kurlbaum-Holborn pyrometer and the other with a König spectral photometer.

Rotating-Arc. Rotating-Arc Lamp (Lampe a arc rotatif). Industrie électrique, vol. 29, no. 667, April 10, 1920, pp. 125-126, 1 fig. Positive electrode is a carbon placed along axis of negative electrode which is made of metal and has annular shape. Solenoid surrounds annular electrode. Current through solenoid causes rapid rotation of arc. Negative electrode is cooled by water.

Tungsten-Electrode. The Ediswan "Pointolite" Lamp. Elec. Rev. (Lond.), vol. 86, no. 2197, Jan. 2, 1920, pp. 9-10, 5 figs. Arc lamp with one or two tungsten electrodes, arc burning in partial vacuum within glass bulb similar to that of an incandescent-filament lamp.

ELECTRIC LAMPS, INCANDESCENT

Gas-Filled vs. Vacuum. What Is an Incandescent Lamp? R. W. Shenton. Sci. Am. Supp., vol. 88, no. 2284, Oct. 25, 1919, pp. 238-239, 2 figs. Vacuum versus gas-filled lamps and relation between life and efficiency.

Life. Records of Lamp Service in a Large Park System, C. H. Shepherd. Elec. Rev. (Chicago), vol. 75, no. 25, Dec. 20, 1919, pp. 1016-1018, 5 figs. Data on lamp life and apparatus trouble.

Luminous Efficiency. Luminous Efficiency of Incandescent Bodies (Etude du rendement lumineux des corps incandescents), R. Painvin. Revue générale de l'Electricité, vol. 7, no. 24, June 12, 1920, pp. 787-791. Formula is established for calculating, in terms of temperature, luminous efficiency of carbon and tungsten filaments of incandescent lamps.

Manufacture. The Developments in Artificial Illumination, C. D. Wagoner. Elec. Rev., vol. 77, no. 15, Oct. 9, 1920, pp. 549-552, 5 figs. Various steps in use and application of types of lighting devices. Processes and details in manufacture of modern incandescent lamps. Magnitude and influence of industry.

The Manufacture of Incandescent Lamps, C. W. Starker. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1027-1031, 16 figs., and vol. 52, no. 1, Jan. 1, 1920, pp. 15-19, 25 figs. Dec.: Explanation of physical and mechanical facts which form basis for manufacturing processes. Jan.: Includes charts of efficiency of drawn-wire tungsten lamp, variation in candle power, and relation of energy to cost of renewals for lamps of different efficiency.

Mazda. The White Mazda Lamp, Earl A. Anderson. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 711-714, 4 figs. New type said to be specially effective in reducing glare. Bulb is made of special white glass.

Neon. A New Glow Lamp, F. Schröter. Elecn., vol. 83, no. 2163, Oct. 31, 1919, p. 507. In bulb containing mixture of neon and helium at pressure of 8 mm., cathode of large surface is placed so close to anode that at 220 volts discharge starts.

Renewal. Renewed Lamps. Elecn., vol. 83, no. 2171, Dec. 26, 1919, pp. 750-752, 6 figs. Process followed by English corporation.

Standard Lamp Caps and Holders for. British Standard Specification for Goliath Lamp Caps and Lamp Holders. British Eng. Standards Assn., no. 98, Dec. 1919, 11 pp., 4 figs. For currents up to 15 amperes or powers up to 1000 watts for pressures not exceeding 250 volts when containing case is of metal only, or for pressures not exceeding 650 volts when containing case is of porcelain or of metal with porcelain lining.

Standard Plugs and Sockets for. British Standard Specification for Five-Ampere, Fifteen-Ampere and Thirty-Ampere Two-Pin Wall Plugs and Sockets for Domestic Purposes. British Eng. Standards Assn., no. 73, Dec. 1919, 12 pp., 2 figs.

Switching to Reduced Voltage. An Automatic Switch for Street Lamps (Ein selbsttätiger Umschalter für Strassenbeleuchtung), L. Bloch. Zeitschrift für Transportwesen u. Strassenbau, vol. 36, no. 21, July 20, 1919, pp. 246-247, 2 figs. Description and illustrations of an automatic apparatus designed by the German General Electric Co. for the automatic switching of street lamps from full voltage to reduced voltage.

Tungsten. Report on Incandescent Lamps and Lamp Specifications. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 355-360. Need is shown for development of rugged type of tungsten lamp for portable service. Committee report of Assn. Ry. Elec. Engrs.

Residual Gas and Tungsten Deposits in Glow Lamps. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 365-366. Abstract of two papers, one on removal of residual gas and one on influence of different instances on light absorption by tungsten films, presented by L. Hamburg, Mrs. Holst, E. Lely, and E. Oesterhuis to Amsterdam Academy.

The Japanese Specification for Tungsten Incandescent Electric Lamps. Illuminating Engr., vol. 12, no. 10, Oct. 1919, pp. 283-285. Prepared by committee appointed by Japanese Illum. Engr. Soc. and Japanese Electrotechnical Committee.

Tungsten Wire for Electric Lamp Filaments (Fremgangsmaaden ved Teækning af Wolframtraad), Albert Ohnstein. Ingeniren, vol. 29, no. 61, July 31, 1920, pp. 453-455. Method used by A. E. G. Co. of Berlin, which consists in reducing brittle powdered metal to a fine wire sufficiently strong to withstand shaking ordinarily experienced by lamps.

See also LIGHTING, Shop.

Watertight Fittings. British Standard Specification for Watertight Fittings for Incandescent Electric Lamps. British Eng. Standards Assn., no. 97, 1920, 33 pp., 38 figs. Specifications approved on Aug. 5, 1920.

ELECTRIC LAMPS, MERCURY-ARC

Automatic Arc-Forming. New Alternating-Current Mercury Arc (Un nouvel arc à mercure à courant alternatif), Henri Georges. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 458-460. Quartz tube filled with neon and having electrodes leading into small mercury containers.

New Mercury Arc Which Lights Automatically (Un nouvel arc à mercure à allumage automatique), Henri Georges. Revue générale de l'Electricité, vol. 6, no. 23, Dec. 6, 1919, pp. 815-819, 7 figs. Bulb with inert gas and containing also tungsten filament connected in series with arc has its open end dipped in mercury; when current is turned on filament becomes incandescent and gas expands, causing bubbling of the mercury and thus forming arc.

Cooper Hewitt. The Cooper Hewitt Mercury Vapor Lamp, L. J. Buttolph. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 741-751, 12 figs. Theory and operation.

ELECTRIC LOCOMOTIVES

Accelerating. Railroad Electrification Facts and Factors, A. J. Manson. Ry. Elec. Engr., vol. 10, no. 12, Dec. 1919, pp. 444-448, 6 figs., and vol. 11, no. 1, Jan. 1920, pp. 17-20, 7 figs. Dec.: Comparative discussion of various methods used in accelerating electric locomotives. Jan.: Theoretical study of energy lost in accelerating electric locomotives by various methods of control.

Adhesive Weight. The Utilization of the Adhesive Weight of Electric Locomotives (Die Ausnutzung des Reibungsgewichtes elektrischer Lokomotiven), A. W. Zuidweg. Elektrotechnische Zeitschrift, vol. 41, no. 22, June 3, 1920, pp. 425-427, 2 figs. It is shown that the coefficient of friction, on which the tractive power of a locomotive depends, varies independently of speed and axle pressure, and that occasionally incorrect values and terms are found in technical literature. Recommends experiments in this direction which would be also useful in locomotive construction and the development of rapid-acting brakes.

Axle-Generator Regenerating System. See C. M. & St. P. Ry.

British. British Electric Locomotives for Freight Service. Ry. Engr., vol. 41, no. 488, Sept. 1920, pp. 368-378, 12 figs. partly on supp.

plate. Dimensions: Total weight, 74 tons 8 cwt.; length over buffers, 39 ft. 4 in.; height from rail to center of buffers, 3 ft. 5 in.; height of cab roof from rail, 11 ft. 6¼ in.; width of cab, 7 ft. 6¼ in.; total wheelbase, 27 ft.; diameter of wheels, 24 ft.; motor equipment of each locomotive consists of four totally enclosed motors, each driving axle through single-reduction twin gearing.

Brown, Boveri & Co. Electric Locomotives of the Gothard Railway, Switzerland (Les locomotives électriques du chemin de fer du Gothard, Suisse). Génie Civil, vol. 76, no. 1, Jan. 3, 1920, pp. 1-9, 21 figs. partly on supp. plate. Principal characteristics are: Tension, 7500 or 15,000 volts; frequency, 16 2/3 periods per second; power at drawbar, 1560 hp.; speed, normal, 50 km. per hr. (maximum, 75 km.); diameter of driving wheels, 1.35 m.; total length, 13.5 m.

The Single-Phase Locomotives of the Gothard Railway, Switzerland, Built by Brown, Boveri & Co. (Les locomotives électriques du Chemin de fer du Gothard, Suisse). Locomotives monophasées de la Société Brown, Boveri et Cie). Génie Civil, vol. 76, no. 11, Mar. 13, 1920, pp. 265-268, 8 figs. partly on supp. plate. Locomotives operate at 15,000 volts, under frequency of 16 2/3 periods, and have four motors, each of 550 hp.

C. M. & St. P. Ry. A 3000-volt Direct-Current Passenger Locomotive for the Chicago, Milwaukee & St. Paul Railway, W. D. Bearce. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1004-1007, 6 figs. Locomotive is of bi-polar gearless type, with motor armatures mounted directly on driving axles, and is designed for handling in normal service a 12-car train weighing 960 tons trailing against grade of 2 per cent at 25 miles per hour.

Auxiliary Rotating Apparatus for the Chicago, Milwaukee & St. Paul Locomotives, R. E. Ferris. Elec. Jl., vol. 17, no. 4, Apr. 1920, pp. 128-131, 13 figs. Description and illustrations of apparatus said to consist almost entirely of 85-volt generators or motors, the only exception being motor for motor-generator set.

Electric Passenger Locomotives for the St. Paul. Ry. Age, vol. 68, no. 3, Jan. 16, 1920, pp. 233-236, 5 figs. Also Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 353-355, 5 figs. New type will develop 4200 hp. for an hour without exceeding normal rated temperature of motors and will have normal starting drawbar pull of 100,000 lb. Wheel arrangement is for 4-6-2-2-6-4, with 68-in. drivers, rigid wheelbase of 16 ft. 9 in. and total wheelbase of 79 ft. 10 in.

Electric Passenger Locomotives for the St. Paul. Ry. Elec. Engr., vol. 11, no. 2, Feb. 1920, pp. 45-48, 5 figs. Locomotive will develop 4200 hp. for an hour without exceeding normal rated temperature of motors and will have normal starting drawbar-pull of 100,000 lb. It consists of two duplicate running gears of Pacific type, placed back to back, supporting single cab.

Exhibition Tests of 3000-Volt Direct-Current Passenger Locomotive. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1008-1010, 4 figs. Regenerative braking tests of bi-polar gearless Chicago, Milwaukee & St. Paul passenger locomotive.

Layout of Apparatus in the Cab of the Chicago, Milwaukee & St. Paul Locomotives, C. C. Whittaker. Elec. Jl., vol. 17, no. 6, June 1920, pp. 249-250, 3 figs. Diagram of weight distribution on locomotive cab frame.

New Electric Locomotives for C. M. & St. P. Ry. Ry. Rev., vol. 65, no. 19, Nov. 8, 1919, pp. 675-677, 5 figs. Locomotives weigh 265 tons each and operate on direct current at 3,000 volt. They have fourteen axles of which front and rear are guiding axles, each of the twelve remaining carrying armature of a bi-polar motor.

New Electric Locomotives for the C. M. & St. P. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 259-264, 9 figs. Comparative study of two types recently designed for passenger service, one of 3,380 hp. built by General Electric Co., and the other of 4,200 hp. built by Westinghouse Electric & Manufacturing Co.

New Gearless Passenger Locomotives for the Chicago, Milwaukee & St. Paul Railway. Elec. Traction, vol. 15, 1919, pp. 752-754, 2 figs. Two hundred and sixty-five ton, 3000 volt, d. c. locomotive with armatures mounted directly on driving axles tested at speed of 65 miles per hr.

New Passenger Locomotives for St. Paul's Rocky Mountain Division. Elec. Ry. Jl., vol. 55, no. 1, Jan. 3, 1920, pp. 36-38, 2 figs. Diagram showing general arrangement of equipment, dimensions, etc.

New Two-Hundred Seventy-Five Ton Passenger Locomotives, T. A. Durkin, Jr. Elec. Traction, vol. 16, no. 2, Feb. 15, 1920, pp. 95-96, 2 figs. Electric locomotives for Chicago, Milwaukee & St. Paul. Locomotives are rated at 4200 hp., have Pacific type running gears and 4-6-2—2-6-4 wheel arrangement.

Powerful Electric Passenger Locomotives for Chicago, Milwaukee & St. Paul Railroad. Ry. Jl., vol. 26, no. 6, June 1920, pp. 21-22. One of distinctive mechanical features is said to be fact that only non-spring-borne weight on tracks is that of wheels, axles and journal bearings. Weight, 275 tons; maximum speed, 65 mi. per hr.; tractive effort is 66,000 lb. for 1 hr. and 49,000 lb. continuously; 4200 hp. for 1 hr. and 3400 hp. for continuous operation.

The Auxiliary and Lighting Control Equipment, John A. Clarke, Jr. Elec. Jl., vol. 17, no. 6, June 1920, pp. 244-248, 10 figs. Auxiliary power is obtained from 35-kw. motor-generator set together with 378 ampere-hour storage battery.

The Axle-Generator Regenerating System Used on the Chicago, Milwaukee & St. Paul Passenger Locomotives, R. E. Ferris. Elec. Jl., vol. 17, no. 2, Feb. 1920, pp. 46-48, 4 figs. Main motors are separately excited from axle-generator whose fields are separately excited in turn from storage battery. Axle-generator is connected across main motor fields with balancing resistance in series.

The Electrical Equipment and Control of the Chicago, Milwaukee & St. Paul Locomotives, P. L. Mardis. Elec. Jl., vol. 17, no. 6, June 1920, pp. 235-244, 18 figs. Schematic diagram of control circuits and regenerative braking connections.

The New Passenger Locomotives for the Chicago, Milwaukee &. St. Paul Railroad, N. W. Storer. Elec. Jl., vol. 17, no. 3, Mar. 1920, pp. 84-85, 1 fig. Electric locomotives of 4200 hp., with six motors arranged to secure three running speeds, one-third, two-thirds and full speeds.

See also Tests.

Citröen-Geared. Citröen Gear for Electric Locomotives. Eng., vol. 109, no. 2839, May 28, 1920, pp. 712-715, 8 figs. Power transmitted by gearing is 1000 b.hp. on speeds of 550 r.p.m. and 169 r.p.m., corresponding to traveling speed of 26 m.p.h., with wheels 4 ft. 3½ in. in diameter, maximum speed being 920 r.p.m. at motor and 43.5 m.p.h. on track.

Critical Speed. The Critical Speed of the Lötschberg Locomotive, Type 1 E 1, Analytically and Graphically Computed (Die kritische Ge-

schwindigkeit der Lötschberg-Lokomotive, Typ 1 E 1, analytisch und graphisch berechnet), Karl E. Müller. Schweizerische Bauzeitung, vol. 75, no. 10, Mar. 6, 1920, pp. 107-110, 5 figs. Calculation said to prove that theory of the shaking vibration of driving gear is now developed to point where it can be practically applied. Reference is made to investigations and calculating methods of Couwenhoven.

Design. Electrification of Steam Railroads in 1919, Edwin B. Katte. Off. Proc. New York RR. Club, vol. 29, no. 10, Nov. 21, 1919, pp. 5767-5773, 4 figs. Trend of design of electric locomotives.

Development. Electric Locomotives, Franz Unger. Eng. Progress, vol. 1, no. 2, Feb. 1920, pp. 77-84, 22 figs. Notes on development and modern design, including continuous-current, accumulator, three-phase and single-phase railways; construction of locomotives for industrial railways, mining and colliery duty.

Electric Locomotives for Industrial Purposes, Walter Fixter and Kenneth Andrews. Assn. Iron & Steel Elec. Engrs., Nov. 1919, pp. 9-15 and (discussion) pp. 15-29, 5 figs. Survey of recent developments of electric locomotive, both from electric and mechanical standpoint.

Driving Gear. The Driving Gear of Electric Locomotives (Ueber Antriebe und Bauarten elektrischer Lokomotiven), Richard Baecker. Annalen für Gewerbe u. Bauwesen, vol. 86, nos. 8 and 9, Apr. 15 and May 1, 1920, pp. 61-65 and 69-76, 21 figs. Discussion of arrangements heretofore in use for the transmission of the twisting moment of motor to the axles of wheels systematically arranged according to their kinematic effect; relationship between driving system and design of locomotive is pointed out.

The Mechanical Driving Gear of Electric Trunk Line Locomotives (Das mechanische Triebwerk elektrischer Vollbahnlokomotiven), E. E. Seefehlner. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 38 and 40, Sept. 18 and Oct. 2, 1920, pp. 761-766 and 815-817, 49 figs. Fundamental peculiarities of drives with under-frame or upper-frame motors; axle motor, transmission motor and flexible transmission; parallel crank gear with and without geared transmission, etc.; loose shaft with parallel crank gear; the Kando coupling frames, double-rod drive with and without loose shaft; etc.

Gearless. A Gearless Electric Locomotive. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 57-60, 7 figs. Chicago, Milwaukee & St. Paul 3000-volt, d. c. locomotive. Specifications are: Length inside knuckles, 76 ft.; total wheel base, 67 ft.; diameter driving wheels, 44 in.; weight electrical equipment, 235,000 lb.; weight mechanical equipment, 295,000 lb.; weight on drivers, 458,000 lb.; number of motors, 12; one hour rating, 3240 hp.

Gearless Electric Locomotives for C. M. & St. P. Ry. Age, vol. 67, no. 17, Oct. 24, 1919, pp. 819-821, 2 figs. Locomotive weighs 265 tons with 229 tons on drivers. It has 14 axles, 12 of which are driving and two guiding axles. Attention is called to design of leading and trailing trucks and method of suspension of cab weight upon them.

Industrial. Electric Locomotives for Industrial Purposes, Kenneth Andrew and Walter Fixter. Jl. Engrs. Club, Philadelphia, vol. 37, no. 182, Jan. 1920, pp. 10-16, 10 figs. General description, advantages and adaptation of storage-battery, trolley, and combination storage-battery and trolley types of locomotives. Paper presented before Assn. of Iron and Steel Elec. Engrs.

Industrial Types. Industrial Type Electric Locomotives in Steel Mill Operations, H. H. Johnston. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 392-396, 9 figs. Their uses and advantages.

Italian State Railways. A Powerful Three-Phase Locomotive. Elecn., vol. 85, no. 2205, Aug. 20, 1920, pp. 204-206, 5 figs. Line voltage, 3000 to 3700; frequency, 15 to 17; number of traction motors, 2; number of driving wheels, coupled, 6; number of bogie wheels, 8; diameter of driving wheels, 1630 mm.; diameter of bogie wheel, 960 mm.; tractive effort, 9000 kg.; power, 1670 hp.; synchronous speed, 50 km./hr.

Logging. Electrical Logging, R. E. Gray. Jl. Electricity, vol. 43, no. 11, Dec. 1, 1919, pp. 492-494, 3 figs. How electric yarding donkey has been used by a lumber company.

Lötschberg. See Critical Speed.

Narrow-Gage, Freight. High-Power Narrow-Gage Locomotives for Freight Trains (Locomotives de grande puissance à voie etroite pour trains de marchandises). Industrie Electrique, vol. 28, no. 660, Dec. 25, 1919, pp. 463-467, 5 figs. Specifications: Length, 13.9 m.; gage, 1 m.; diameter of driving wheels, 0.85 m.; weight, mechanical equipment, 25,600 kg.; weight, electrical equipment, 17,000 kg. Built by Brown-Boveri & Co.

N. Y., N. H. & H. R. R. 180-Ton New Haven Electric Locomotives, F. W. Carter. Ry. Age, vol. 68, no. 23, June 4, 1920, pp. 1563-1565, 5 figs. Power collected from 600-volt overrunning or underrunning third rail or from 11,000-volt overhead wire. Specifications: Classification, 2-6-2-2-6-2; number driving wheels, 12; diameter driving wheels, 63 in.; total weight, including sand, oil and water, 170 tons; overall length, 69 ft. 0 in.; method of drive, geared; maximum speed, 70 m.p.h.

Parallel-Crank Drive. Vibratory Phenomena of the Parallel-Crank Drive of Electric Locomotives (Ueber Schüttelerscheinungen des Parallel-Kurbelantriebes elektrischer Lokomotiven), Iwan Döry. Elektrotechnische Zeitschrift, vol. 41, no. 16, Apr. 22, 1920, pp. 313-314. States that the oscillations of the driving gear can be harmonic if driving gear is without play; duration of oscillation is then constant and isochronous, but if bearing plays freely the oscillation becomes pseudoharmonic.

Passenger. See C. M. & St. P. Ry.

Remote-Control. Remotely Controlled Electric Locomotives in the By-Product Coke Industry, H. H. Johnston. Elec. Jl., vol. 17, no. 2, Feb. 1920, pp. 49-51, 4 figs. Cycle of operation is explained. It is claimed that use of electric locomotives has eliminated large amount of labor and reduced spillage at loading chute.

Repair Costs. The Logical Unit for Comparing Repair Costs of Electric Locomotives and Cars, Hugh Pattison. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 475-477. Kilowatt-hour input to locomotive or car is thought to be much more correct and convenient unit than locomotive-mile or train-mile units.

St. Gothard Ry. See Brown, Boveri & Co.

Single-Phase. 1C + C1 Freight Locomotives for the Gotthard Line of the Swiss Federal R. R. (1C+C1 Güterzug-Lokomotiven für die Gotthardlinie der S. B. B.). Schweizerische Bauzeitung, vol. 75, nos. 21 and 22, May 22 and 29, 1920, pp. 229-232 and 237-241, 20 figs., 2 on supp. plate. Details of single-phase alternating-current, 2200-hp. locomotive. Specifications: Wheel base, 16.5 m.; driving wheel diam., 1.35 m.; weight, including personnel and supplies, 129 tons; maximum axle load, 18.2 tons; maximum speed, 65 km. per hr., etc. Notes on electrical equipment based on data obtained from the Oerlikon Machine Works.

Electric B + B + B—Freight Locomotives

on Silesian Mountain Railway (Elektrische B + B + B—Lokomotiven für die Güterzugbeförderung auf den schlesischen Gebirgsbahnen), Winkler. Elektrische Kraftbetriebe u. Bahnen, vol. 17, no. 20, July 14, 1919, pp. 153-156, 3 figs. These single-phase a. c. engines have a wheelbase of 13,660 mm.; their entire length, between buffers, is 17,200 mm.

Slip Arrester. A Slip Arrester for Heavy Electric Locomotives, C. C. Whittaker. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 446-447, 5 figs. Device automatically removes torque from or decreases it on axle slipping, instant after slipping occurs.

Storage-Battery. Storage-Battery Locomotives in Mine Work, Joseph Appleton. Coal Age, vol. 16, no. 19, Nov. 6, 1919, pp. 744-750, 2 figs. It is emphasized that "storage-battery locomotives are not suitable for all mining conditions." Hence it is urged to "ascertain from those competent to decide whether the use of a storage battery is warranted" in any particular case.

See also Industrial; Towing on Canals.

Swiss. Express Electric Locomotives for The Gothard Line of the Swiss Federal Railways. Tramway and Ry. World, vol. 47, no. 24, May 13, 1920, pp. 251-253, 11 figs. Two types, 2-6-2 and 2-4-4-2. Current is applied in single phase under pressure of 15,000/7,500 volts. Horsepower developed is 1650 hp. and 2250 hp., respectively.

New Electric Locomotives of the Swiss Federal Railways Built by Brown, Boveri & Co. (Les nouvelles locomotives électriques des chemins de fer fédéraux suisses équipées par la Société Brown, Boveri et Cie). Révue générale de l'Électricité, vol. 7, no. 17, April 24, 1920, pp. 563-568, 6 figs. Data: Single-phase current at 15,000 volts; four 540-hp. motors; diameter of driving wheels, 1350 mm.; total weight, 107.6 tons; maximum speed, 75 km. per hr.

New Single-Phase Locomotives of the Federal Swiss Railways (Les nouvelles locomotives monophasées des chemins de fer fédéraux), Lucien Pahin. Industrie Électrique, vol. 29, no. 665, March 10, 1920, pp. 85-92, 9 figs. Specifications of 2-4-4-2 passenger type: Length overall, 16.5 meters; diameter of driving wheels, 1.35 m.; weight of electric equipment, 49.6 tons; total weight, 107.6 tons; maximum speed, 75 km. per hr. Specifications of 2-6-6-2 freight type: Length overall, 19.24 m.; diameter of driving wheels, 1.35 m.; weight of electric equipment, 51.2 tons; total weight, 121 tons; maximum speed, 65 km. per hr. Power is transmitted by gears in both types.

Swiss Federal Railways Buy New Electric Locomotives. Elec. Ry. Jl., vol. 56, no. 6, Aug. 7, 1920, pp. 256-260, 10 figs. Single-phase freight locomotives manufactured by Oerlikon Co. Data: Height, 12 ft. 5 in.; total length, 63 ft. 6 in.; gage, 4 ft. 8½ in.; diameter, 53¼ in.; crankpin stroke, 23⅝ in.; transmission ratio, 43.03; total weight, 256,000 lb.; adhesive weight, 208,000 lb.

The 1B + B1 Alternating Current Locomotives for the Bernese Railways (Die 1B + B1 Wechselstrom-Lokomotiven für die Bernischen Dekretsbahnen). Schweizerische Bauzeitung, vol. 76, no. 8, Aug. 21, 1920, pp. 83-84, 2 figs. Brief particulars of new 2-4-4-2 single-phase locomotives constructed on similar lines to all the locomotives of Swiss Federal Railway.

See also Brown, Boveri & Co.

Switchers. Electric Locomotives in Switching Service, O. Wortman. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 913-914, 1 fig. Discussion of peculiarities of electric locomotive making its use advantageous for switching operations as compared with steam locomotive in same service, and descriptive reference to popular design of electric switcher being manufactured by Westinghouse Elec. & Mfg. Co. for use of large number of roads.

Tests. St. Paul Locomotive Tested at Erie. Elec. Ry. Jl., vol. 54, no. 18, Nov. 1, 1919, pp. 827-831, 16 figs.; also Ry Age, vol. 67, no. 15, Oct. 10, 1919, pp. 749-750, 2 figs. Regenerating tests and "tug-of-war" test of giant 3000-volt, direct-current locomotive built by General Elec. Co. for Chicago, Milwaukee & St. Paul Ry. Locomotive is equipped with bi-polar motors of gearless type with motor armatures mounted directly upon driving axles. Locomotive weighs 265 tons of which 229 tons are on drivers.

Three-Phase. New "Baltic" Three-Phase High-Speed Locomotives used in the Italian Railways (Nouvelles locomotives triphasées à grande vitesse type "Baltic" des Chemins de Fer de l'État Italien). Industrie Electrique, vol. 28, no. 658, Nov. 25, 1919, pp. 423-436, 15 figs. Principal characteristics are: Two traction motors coupled by crank and connecting rods to three 1630-mm. driving wheels; total weight 92 tons; operated at 330 volts.

Towing on Canals. Towing on Water-Power and Navigation Canals (Zum Schiffzugbetrieb auf Wasserkraft und Schiffahrtskanälen), C. Reindl. Zeitschrift für das gesamte Turbinenwesen, vol. 16, nos. 25 and 26, Sept. 10 and 20, 1919, pp. 257-261 and 274-277, 11 figs. Description and illustrations of electric towing locomotives, both of the storage-battery and the overhead-trolley type.

[See also LOCOMOTIVES; Diesel-Electric; QUARRYING, Electric Locomotives in.]

ELECTRIC MEASURING INSTRUMENTS

Calibration of. New Current Balance for Calibration Work, Otto A. Knopp. Elec. World, vol. 75, no. 18, May 1, 1920, pp. 993-996, 6 figs. Testing device developed by writer and used in electrical laboratory of Pacific Gas & Electric Co. in routine calibration of ammeters and wattmeters.

ELECTRIC METERS

Electromagnetic. Electromagnetic Apparatus for Measuring High Potentials (Disposizione elettrometrica per gli alti Potenziali), Lavoro Amaduzzi. Elettrotecnica, vol. 7, no. 9, Mar. 25, 1920, p. 142, 3 figs. System employing deviation of gold leaves placed inside partially opened metallic box.

Integrating. Meter Work of a Municipal Electricity Supply System, W. H. Baynes. Trans. South African Inst. Elec. Engrs., vol. 10, no. 10, Oct. 1919, pp. 145-157, 5 figs. Construction and operation of various types of integrating electric meters.

Switchboard Connections. Switchboard Meter Connections for Alternating Current Circuits—II, J. C. Group. Elec. Jl., vol. 17, no. 2, Feb. 1920, pp. 61-65, 14 figs. Schematic arrangements for 2-phase and 4-phase circuits.

Work with. Meter Work of a Municipal Electricity Supply System, W. H. Baynes. Trans. South African Inst. Elec. Engrs., vol. 10, no. 9, Sept. 1919, pp. 126-141 and (discussion) pp. 141-142, 4 figs. Description of work connected with electricity meters as applied to supply system.

[See also WATT-HOUR METERS.]

ELECTRIC MOTORS

Alternating-Current. See ELECTRIC MOTORS, A.C.

Brushes. See BRUSHES.

Care in Shops. The Care of Shop Motors, C. E. Clewell. Am. Mach., vol. 51, no. 20, Nov. 13-20,

1919, pp. 877-880, 6 figs. Notes on general instructions to be followed in setting up motors for first time, together with some cautions on manipulation of electric machinery.

Cooling of. Dust- and Gas-Tight Electric Motors with Cooling Shell (Staub- und gasdicht gekapselte Kühlmantel-Motoren). Elektrotechnischer Anzeiger, vol. 37, no. 81, May 20, 1920, pp. 356-358, 6 figs. Built for output of 0.5 to 500 kw. and possessing a tightly closed casing encircled by a shell, through which cool air circulates.

Direct-Current. See ELECTRIC MOTORS, D.C.

Field-Coil Design. See ELECTRIC GENERATORS, Field-Coil Design.

Flame-Proof. Experiments with Flame-Proof Electric Motors in Explosive Gas Mixtures (Ueber Versuche mit schlagwettergeschützten Elektromotoren in Gasgemischen), W. Leybold. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 2, Jan. 10, 1920, pp. 17-20. Tables showing results of a series of explosion tests carried out by the Siemens-Schuckert Works in Nuremberg with the city illuminating gas, in order to test the safety of protection devices for electric motors for driving various apparatus in gas works.

Installation. Lining up a Motor for Shafting or Machine Drive, K. A. Reed. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 459-461, 4 figs. How to install motor on ceiling, wall or floor and line it up to shafting is explained and methods of handling motor during installation are given.

The Installation of Electric Motors, E. Austin. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 645-647, 6 figs. Special work for which each of types of winding is suitable.

Intermittent Operation. Efficiency of Electric Motors for Intermittent Operation. (Die Leistungsbewertung der Elektromotoren für aussetzende Betriebe), E. Adler and C. Schiebeler. Elektrotechnische Zeitschrift, vol. 41, nos. 25 and 26, June 24 and 30, 1920, pp. 485-488 and 508-510, 12 figs. Discussion of conditions to be considered in evaluation of performance. Writer points out faults of present method and describes and recommends a new method.

Lubrication. Lubrication of Electric Motors, W. F. Osborne. Power, vol. 51, no. 10, Mar. 9, 1920, pp. 378-379. Descriptions and viscosities for electric-motor oils covering wide range of conditions. Use of grease and oil-soaked waste is considered.

Maintenance. The Care of Shop Motors, C. E. Clewell. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 877-880, 6 figs. Notes on general instructions to be followed in setting up motors for first time, together with cautions on manipulation of electric machinery.

Maximum-Rated. Maximum-Rated or 50-Degree Motor, A. C. Bunker. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 73-75. Argument for continued use of motor with good factor of safety. It is held that slight saving in first cost of a 50-degree motor is overbalanced by greater maintenance expense.

The Fifty Degree Rise Method of Motor Rating, J. M. Hipple. Elec. Jl., vol. 17, no. 5, May 1920, pp. 203-205. Argument is presented for establishing 50 deg. rise as standard for semi-enclosed general-purpose motors and for open and semi-enclosed short-time rated motors.

Speed Regulation. Recommendations for Regulating the Speed of Electric Motors for Driving Paper Machines (Vorschläge zur Regelung der Umlaufzahl von Elektromotoren zum Antrieb von Papiermaschinen), P. Bachert. Elektrische Kraftbetriebe u. Bahnen, vol. 17, no. 36, Dec. 24, 1919, pp. 281-283, 1 fig. Writer enumerates disturbances likely to occur when transmission plant is set at lower speed, and describes an apparatus which renders it difficult or impossible to exceed a certain connection speed.

Starting Rheostats. Economical Repairing of Starting Boxes, E. C. Parham. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 753-754, 2 figs. Methods are suggested for obtaining and keeping records to help repairman to make repairs on starting rheostats.

Steel Mills. Keeping Steel-Mill Motors in Service, O. Needham. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 237-239, 3 figs. Tests of various kinds are prescribed for main mill motors before they are started up and periodically thereafter in order to let the user know the condition of insulation in machines.

[See also FANS, CENTRIFUGAL, Motors for; ELECTRICAL MACHINERY, Brushes; Design.]

ELECTRIC MOTORS, A.C.

Asynchronous. See Induction.

Autotransformer Starters. Autotransformer Motor Starters, H. D. James and R. E. DeCamp. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp 30-35, 11 figs. Describes methods of switching autotransformer starters and points out advantages of using them instead of resistance to obtain reduced voltage for starting purposes.

Commutator Motors. Measurements of Single-Phase Commutator Motors (Die Abmessungen der Einphasen-Bahnmotoren), Franz Unger. Elektrotechnische Zeitschrift, vol. 41, no. 1, Jan. 1, 1920, pp. 3-7, 9 figs. The output coefficient of single-phase commutator motors based on output and torque is derived. Curves are given, based on permissible magnetic and electric stresses of copper and active iron, for permissible ratios of ampere-conduction per current armature circumference and induction in air, whereby Radt's investigations are used as basic principle. Curves are also given for the output coefficients.

The Alternating-Current Commutator Motor, B. G. Lamme. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 249-266, 22 figs. Consideration of different e.m.f.'s which should be taken into account in various types of a.c. commutator motors, and it is shown in general way that e.m.f.'s involved in speed control also appear in commutation problem. Conditions of commutation and brush operation are treated and figures are given for comparison of a. c. and d. c. commutating limits.

Uses of Commutators for Polyphase Currents (Sur certains modes d'emploi du collecteur en courants polyphasés), L. Gratzmüller. Revue générale de l'Électricité, vol. 6, no. 20, Nov. 15, 1919, pp. 659-665, 7 figs. How to regulate speed of asynchronous ring motor by relative displacement of two sets of brushes upon commutator of transformer, field of which rotates in synchronism with rotor.

Development. Provisional Limitations in Electric Machine Construction (Vorläufige Grenzen im Elektromaschinenbau), W. Reichel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 29 and 30, July 17 and 24, 1920, pp. 543-548 and 575-577, 30 figs. Notes on standard motors; development of special construction types. It is pointed out that stationary motors for conveyor plants, rolling mills, ship propulsion, etc., especially in case of three-phase current drive, have not yet reached the limits of their capacity. Transformers, converters, current generators and complete power plants are discussed. From address before Assn. German Engrs.

Heating of. See ELECTRIC GENERATORS, A. C., Heating of.

Induction. Automatic Compensator for Starting Induction Motors. Power, vol. 51, no. 9, Mar. 2, 1920, p. 335, 2 figs. Describes apparatus for automatically starting and stopping squirrel-cage type induction motors or for controlling them from remote points, developed by Industrial Controller Co., Milwaukee, Wis.

Connecting Three-Phase Induction Motor, A. C. Roe. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 170-171, 6 figs. on supp. plate. Tables and winding diagrams give information necessary for connecting two-pole to twelve-pole motors. Complete data on connecting coils in unequal groups.

Cost of Reinsulating Induction Motor Windings, J. A. Knutsen. Elec. World, vol. 76, no. 4, July 24, 1920, p. 164. Study of methods and materials and installation of new system of reinsulating induction motor windings results in considerable saving.

Effects of Flywheel upon Slip and Output of the Induction Motor, D. Yasukawa. (In Japanese.) Denki Gakkwai Zasshi, no. 377, Dec. 10, 1919.

How to Calculate a New Winding for an Inductor-Motor Stator Core, A. M. Dudley. Power, vol. 52, no. 1, July 6, 1920, pp. 13-18, 5 figs. Six factors that require consideration in figuring new winding for induction motor to operate under new conditions of speed, horsepower, voltage, phase or frequency are enumerated, then problem is worked out to show how each is determined.

Induction Motor Core Losses, P. L. Alger and R. Eksergian. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 906-920, 17 figs. Writers subdivide core losses into six elements and point out that only one of six is ordinarily calculated by designing engineers, with resulting large discrepancies between expectation and fact. Belief is expressed that to calculate other elements approximately is entirely feasible and that such calculations would explain most of variations in core loss now attributed to imperfections in manufacture. Formulæ are developed for losses in core back of teeth, which are found to give larger values than more approximate formulæ now in use and conclusions are presented in form of charts giving correction factors to apply to usual formulæ for all ordinary conditions.

Induction Motors on Unbalanced Voltages, J. Slepian. Elec. World, vol. 75, no. 6, Feb. 7, 1920, pp. 313-315, 5 figs. Formulæ developed showed that for moderate unbalance starting and pull-out torques are only slightly reduced but that continuous capacity of motor is seriously reduced.

Induction Motors Running at Different Frequencies (Contribution à l'étude des moteurs asynchrones fonctionnant à des fréquences différentes), J. Patin. Revue générale de l'Électricité, vol. 7, no. 23, June 5, 1920, pp. 778-781, 3 figs. From circle diagram of motor designed for a certain frequency f, conditions of operation of the same motor for a different frequency f', are derived.

Locating Faults in Induction Motors, A. M. Dudley. Power, vol. 51, nos. 8, 9 and 12, Feb. 24, Mar. 2 and 23, 1920, pp. 299-300, 325-327 and 453-458, 29 figs. Notes on noise and vibration, with observations of behavior of motor to be made when started for first time, and how to distinguish between mechanical and electrical troubles. Ten most common faults in induction-motor windings are enumerated and methods usually followed in locating and correcting these faults are discussed. Tells how to make tests necessary to locate ten most common faults.

Reconnecting Induction Motors—Reconnecting Problems, A. M. Dudley. Power, vol. 51, no. 2, Jan. 13, 1920, pp. 55-58, 7 figs. Problems are worked out to show that any change in an induction motor's operating conditions may be considered as a voltage change.

Reconnecting Two-Phase Induction Motors, A. C. Roe. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 683-684, 30 figs. on supp. plate. Tables and winding diagrams giving information necessary for connecting two-pole to twelve-pole motors.

Requirements for Induction Motor Service. Elec. World, vol. 75, no. 1, Jan. 3, 1920, pp. 12-13. Claims that it is practicable to require only 125 per cent full load current-carrying capacity in spite of high starting current.

The Measurement of Starter Lines of Induction Alternating-Current Motors (Die Bemessung der Anlasserleitungen asynchroner Drehstrommotoren). Elektrotechnischer Anzeiger, vol. 36, no. 147, Dec. 13, 1919, pp. 103-104, 1 fig. Gives chart showing interdependence of rotor voltage and current strength for output up to 50 kw., and the losses in the starter lines caused by heat of current; examples given show its use in solution of problems.

The Starting of Three-Phase Induction Motors with Short-Circuited Armature (Der Anlauf von Drehstrommotoren mit Kurzschlussanker), Robert Moser. Elektrotechnik u. Maschinenbau, vol. 38, no. 11, Mar. 14, 1920, pp. 117-119, 3 figs. Discussion of Rüdenberg's work published in same journal (nos. 44 and 45, 1919), Blanc's article in Zeitschrift des Vereines deutscher Ingenieure (nos. 13 and 16, 1919) and author's investigations in 1905.

Theory of Speed and Power Factor Control of Large Induction Motors by Neutralized Polyphase Alternating Current Commutator Machines, John I. Hull. Jl. Am. Inst. Elec. Engrs., vol. 30, no. 4, Dec. 1919, pp. 29-33, 25 figs. Theory of induction motor control, discussing single-range and double-range speed and power factor control.

See also Polyphase Induction; Starting; Ventilation.

Polyphase Induction. Polyphase Induction Motor Calculations, C. M. Laffon. Universal Engr., vol. 30, no. 4, Dec. 1919, pp. 29-33, 25 figs. Study of magnetomotive-force diagrams, and formulæ far calculating ampere turns required for stator and rotor cores.

Selection. Induction and Synchronous Motors for Industrial Applications, C. W. Drake. Power, vol. 51, no. 20, May 18, 1920, pp. 822-823. Notes on selection of motors. Paper read before Pennsylvania Elec. Assn.

Single-Field Cascade. The Single-Field Cascade Machine, L. J. Hunt. Proc. South Wales Inst. Engrs., vol. 35, no. 2, Feb. 12, 1920, pp. 309-341, 13 figs. It is pointed out that electrically and magnetically "single-field" motor is identical in its action with cascade combination of two separate machines.

Starting. Manual Starters for Small Squirrel-Cage Induction Motors, C. K. Applegarth and H. D. James. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 532-536, 12 figs. Features of design, together with auxiliograph record of test made in 3-phase, 60-cycle, 750-volt line having 55 per cent power factor.

The Starting of Asynchronous Motors with Squirrel-Cage Rotors (Der Anlaufvorgang bei Asynchronmotoren mit Kurschlussanker), Reinhold Rudenberg. Elektrotechnik und Maschinenbau, vol. 37, no. 44, Nov. 2, 1919, pp. 497-504, 13 figs. Calculation of starting stresses based on assumed variation of torsional moment.

See also Induction; TRANSFORMERS, Autotransformers, Motor-Starting.

Stator Windings. Stator Windings and Connections for Two-Phase Motors, Jacob Gintz. Elec. Rev. (Chicago), vol. 77, no. 13, Sept. 25, 1920, pp. 481-483, 6 figs. Describes methods used in determining coil pitch in half-coil and whole-coil windings; rules for connecting coils in groups and assembling groups in phases; three-wire and four-wire circuits.

Substitute-Metal Windings. Efficiency and Power Factor of Motors with Windings of Substitute Metals (Wirkungsgrad und Leistungsfaktor der Motoren mit Wicklungen aus Ersatzmetallen), H. Müller. Elektrotechnische Zeitschrift, vol. 40, no. 39, Sept. 25, 1919, p. 479. Illustrates how formulæ can be calculated from corresponding well-known values of copper winding.

Synchronous. Flywheel Effect for Synchronous Motors Connected to Reciprocating Compressors, R. E. Doherty. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 653-661, 7 figs. General method for determining proper flywheel effect for any given set of conditions.

Influence of Saturation on the Operation of Synchronous Machines (Influence de la saturation sur le fonctionnement des machines synchrones), G. H. Perrin. Revue générale de l'Électricité, vol. 8, no. 3, July 17, 1920, pp. 67-73, 11 figs. Study based on Potier's diagram.

Magnetomotive-Force Diagram of the Synchronous Motor, E. S. Henningsen. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 122-124, 7 figs. Concrete case is assumed as example and method of applying diagram to determination of several characteristics is worked out.

Self-Exciting Synchronous Motor, J. K. Kostko. Elec. World, vol. 75, no. 13, March 27, 1920, pp. 723-726, 4 figs. It is explained how characteristics of synchronous motor with polyphase type of field winding are improved by automatically increasing excitation with load.

Starting Conditions of Synchronous Machines, Alfred Hay, F. N. Mowdawala. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 34-44, 11 figs. Advises that during initial stages of starting power field be kept open, and short-circuited after it has reached value not differing greatly from that required for synchronism.

Study on the Theory of Operating Synchronous Motors in Parallel (Zur Theorie des Parallelbetriebes von Synchronmaschinen), L. Dreyfus. Archiv für Elektrotechnik, vol. 8, no. 4, Aug. 28, 1919, pp. 132-137. With special reference to Benischke's theory.

Synchronous-Motor Applications, W. T. Berkshire. Power, vol. 51, no. 5, Feb. 3, 1920, pp. 166-169, 7 figs. Characteristics of synchronous motor are compared with those of induction motor; applications for which synchronous motor may be used are given and methods of starting are discussed.

Synchronous Motors, W. T. Berkshire. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 112-121, 19 figs. Writer claims that because it has been usual practice to install induction motors wherever power was required from a.c. circuit without regard to their collective effect on power factor of circuit, many systems are operating at low power factor and consequently low efficiency. He points out that judicious employment of synchronous motors in combination with induction motors will correct fault and thereby benefit both distributing companies and consumers. Characteristics and qualifications of sychronous motor for such applications are described.

The Flux Distribution Curve in Synchronous Motors (Die Feldkurve bei synchronen Wechselstrommaschinen), Franz Unger. Elektrotechnische Zeitschrift, vol. 41, no. 16, Apr. 22, 1920, pp. 306-310, 14 figs. Describes a new method for determination of the field distribution curve, in which the line of force is replaced by arc sections. Lengths of equivalent parallel-wall tubes of force are determined, from which coordinates of field distribution curve are derived. Method was found to agree with the Lehmann method, over which it is said to effect a great saving.

The Relation of Flywheel Effect to Hunting in Sychronous Motors, Q. Graham. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 18-20, 1 fig. Formulæ and graph illustrating conditions which tend to produce maximum hunting.

Unity Power-Factor Synchronous Motor, W. T. Berkshire. Power, vol. 51, no. 21, May 25, 1920, pp. 850-851, 4 figs. Examples are worked out to show how 1000-kw. synchronous motor affects total kilovolt-ampere load on system when motor is operating at unity power factor, 0.80 power-factor leading, and 0.0 power-factor leading.

Three-Phase Commutator. The Proportioning of Three-Phase Commutator Motors (Die Bemessung von Drehstrom-Kollektormotoren), Reinhold Rüdenberg. Elektrotechnische Zeitschrift, vol. 41, no. 15, Apr. 15, 1920, pp. 289-292, 4 figs. Includes table giving all the calculated formulæ developed, with which it is easy to follow course of calculation, and some measurements for completion of estimates necessary for construction of the motors.

Ventilation. Ventilation of Induction Motors, Fraser Jeffrey. Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 988-990, 10 figs. Diagram showing flow of air through ducts and discussion of effect of various shapes of ventilating passages.

[See also ELECTRIC MOTORS; ELECTRICAL MACHINERY.]

ELECTRIC MOTORS, D. C.

Brush Adjustment. Operation of Shop Motor Brushes and Contact Devices. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 939-941, 6 figs. Treats of brushes and commutator of shop motor as one of means for determining whether it is operating properly. Notes are included on common adjustment of brushes and brush holders of motor and on care of commutator and brushes.

Commutators. See COMMUTATORS.

Current-Limit Relays. Current Limit Acceleration for Electric Motors, H. D. James. Elec. Jl., vol. 17, no. 2, Feb. 1920, pp. 51-54, 8 figs. Various forms of current-limit relays are described, particularly 3-pole type operated by shunt coil across starting resistor.

Mine Installations. Treatment of Direct-Current Motors for Mining Conditions, T. H. Arnold. Power, vol. 52, no. 15, Oct. 12, 1920, pp. 582-583, 2 figs. Advises dipping and baking armatures in field coils systematically. Dipping and baking process is described.

Operation. Operation of Shop Motor Brushes and Contact Devices, C. E. Clewell. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 939-941, 6 figs. Notes on common adjustment of brushes and brush holder of motor and on care of commutator and brushes.

Starting. Investigating Failure of Direct-Current Motors to Start, E. C. Parham. Power, vol. 51, no. 16, Apr. 20, 1920, pp. 628-630, 6 figs. Detailed explanation is given on how to make tests necessary to treat troubles in a direct-current motor that fails to start.

Variable-Voltage. Direct-Current Motors for Highly Variable Voltage (Gleichstrommotoren für stark veränderliche Spannung), H. Roth. Elektrotechnische Zeitschrift, vol. 41, no. 27,

July 8, 1920, pp. 525-528, 9 figs. Investigation of the behavior of direct-current motors when impressed with variable voltage of from 220 to 330 volts and how, in spite of this great variation in voltage, it is possible to construct motors with unvarying speed by means of differential winding.

[See also COMMUTATORS; ELECTRIC MOTORS; ELECTRICAL MACHINERY.]

ELECTRIC PLANTS

Alabama Power Co. The Alabama Power Company's System, Its Development and Operation, J. M. Oliver, B. Nikiforoff and C. B. McManus. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 980-995, 12 figs. System has total generating capacity of 150,000 kva. and approximately 1000 miles of transmission and distribution lines.

Belgium. The Electric Plants of Belgium Before and During the War (Die öffentlichen Elektrizitätswerke Belgiens vor und während des Krieges), Kurt Pietzsch. Elektrotechnische Zeitschrift, vol. 41, no. 10, Mar. 4, 1920, pp. 191-193, 5 figs. Development of the Belgian electrical industry during recent years is described with special reference to size, number, capacity and generating power of plants.

Changing from Two to Three Phase. Changing System from Two to Three Phase, George H. Hagar. Elec. World, vol. 75, no. 25, June 19, 1920, pp. 1414-1416, 4 figs. By adding booster transformer both two-phase and three-phase energy is said to have been obtained from four-wire system during reconstruction of system in a California city.

Commonwealth Edison Co., Chicago. Service Work for 1919 Below Pre-War Cost, D. W. Roper. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 273-276, 7 figs. Operating records of Commonwealth Edison Co., Chicago. It is said that in spite of increased wages and inroads of war and industry on ranks of trained workers, careful engineering has succeeded in reducing cost. Factors that have played a part in bringing this about are enumerated.

Design. Influence of Wages on Power-Plant Design. Elec. Ry. Jl., vol. 55, no. 21, May 22, 1920, pp. 1043-1046, 8 figs. Complications in conversion of 3000-kw. station into one of 8000-kw. capacity in Charleston, S. C.

Developments. Developments in Power Plants and Generating Stations—III, Alfred Still. Elec. Rev. (Chicago), vol. 77, no. 8, Aug. 21, 1920, pp. 269-275, 10 figs. Hydroelectric and steam-electric stations. Economical considerations. Coal and oil as fuel. Water and steam turbines. Generators. Methods of excitation. Trend of transformer design.

Developments During War. The Development of Electric Plants During the War (Die Entwicklung der Elektrizitätswerke im Weltkriege 1914-1918), Gustav W. Meyer. Elektrotechnischer Anzeiger, vol. 36, no. 85, Aug. 14, 1919, pp. 397-398. Deals with economic effect of coal shortage on electrical plants and its effect on steam and water plants; new water-power plants and projects in Germany and foreign countries; new 110,000-volt plants in Germany; use of substitutes in connection with construction of electric machines, apparatus and lines; consumption of current in war equipment industry and textile industry; the nitrogen industry; use of large rectifiers for converting 3-phase current to continuous current; use of electricity in war zone; prevention of disturbances in operation by extended use of mechanical installations, etc.

Economical Operation. Efficient Operation of Central Power Stations, J. D. Morgan. Power, vol. 50, no. 15, Oct. 7, 1919, pp. 550-557, 14 figs. Data and curves illustrating power-plant operation.

Raising Economy in Prime Mover Practice. Elec. World, vol. 75, no. 22, May 29, 1920, pp. 1257-1260, 4 figs. Problems of burning low-grade fuels, oil engines and hydraulic practice are studied. Committee report presented at convention of Nat. Elec. Light Assn.

European Practice. European Power Plant Practice, Stephen Q. Hayes. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 924-928, 13 figs. Protective devices, switchboards and transformer practice. It is noted that use of draw-out and sheet-metal-inclosed switchboards has become more general abroad than in U. S., and that in matter of power transformers core type is commonly used to facilitate repairs.

Exciter Systems. Considerations Which Determine the Selection and General Design of an Exciter System. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 556-562. Symposium. Comparative study of various exciter systems.

Floating Plant. Britain's Floating Electric Power Station. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 192-193, 3 figs. Oil-fired, 1000-kw. plant carried on steel barge.

Frequency and Voltage Standards. The Standardization of Frequency and Voltage for Electric Light and Power Plants (Vereinheitlichung der Periodenzahl und Spannungen für elektrische Beleuchtung- und Kraftübertragungs-Anlagen). Elektrotechnik u. Maschinenbau, vol. 38, no. 9, Feb. 29, 1920, pp. 93-94. Presents standards proposed by the Committee on standardization of frequency and voltage of the Electrotechnical Soc. of Vienna.

German Battle-Line. Electrical Plant Behind the German Lines. Elec. Times, vol. 57, no. 1483, Mar. 18, 1920, pp. 239-241, 4 figs. Structural features of substations, switching stations, transformer chambers, etc.

Glasgow, Scotland. The Dalmarnock Power Station, Glasgow. Elec. Rev. (Lond.), vol. 87, no. 2233, Sept. 10, 1920, pp. 324-328, 18 figs. Capacity is to be 200,000 kw. Details of turbo-alternator sets, boilers and auxiliary equipment.

Induction-Generator. Induction Generator Plants, C. M. Ripley. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 963-969, 3 figs. It is said that in few instances and under specially favorable circumstances induction generator plant with little or no attendance has been able to justify its installation. Description of several of these is given and it is pointed out that if prices of coal and labor continue to soar at their present rates small induction generator plants will soon be economically more feasible than they are at present.

Semi-Automatic Induction-Generator Plants, L. J. Moore. Elec. World, vol. 74, no. 22, Dec. 27, 1919, pp. 1148-1151, 6 figs. Special attention is given to wiring of plants.

Induction Regulators. Huge Induction Regulator Installation, Raymond Bailey. Elec. World, vol. 75, no. 24, June 12, 1920, pp. 1355-1358, 6 figs. Induction regulators installed by Philadelphia Electric Company, in order to permit operation of their 66,000-volt transmission lines at maximum load under all conditions. Regulators are rated at 1750 kva.

Interconnection. Interchange of Industrial and Central Station Energy, Cornelius G. Weber. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 173-175, 3 figs. Data in a number of individual cases give indication of large savings in coal, labor and transportation possible from electrical interconnection between industrial and central station plants.

Problems Involved in Interconnecting Systems, H. A. Barre. Elec. World, vol. 75, no.

3, Jan. 17, 1920, pp. 136-137, 2 figs. Particularly in regard to switches and load dispatching.

The Manchester-Salford "Linking Up." Elecn., vol. 84, no. 2175, Jan. 23, 1920, pp. 84-86, 6 figs. Details of 33,000-volt equipment.

Japan. On the Power Station of Kyushyu Electric Railway Company, Y. Kusakari. (In Japanese.) Denki Gakkwai Zasshi, no. 375, Oct. 10, 1919.

Layout. Electrical Energy Generating Stations, Terrell Croft. Power House, vol. 13, no. 4, Feb. 20, 1920, pp. 82-84, 9 figs. Writer points out that rating of generator should be proportioned to characteristics of prime mover. Station layout is discussed.

The Electrical Layout of Large Power Systems, Robert Treat. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 918-926, 6 figs. Discussion of means for insuring continuity of service, with comments on investment in protective apparatus and spare equipment which may be justified under varying conditions. Typical transmission network is described and application to this system of principles of selective relaying is taken up.

Load Dispatching. Load Dispatching System of the Philadelphia Electric Company, George P. Roux. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 470-474, 8 figs. A total of approximately 360,000 kw. combined light and power connected load, is applied through territory 40 miles long extending along Western shore of Delaware river from nine steam generating stations.

Load Factor. The Measurement of Maximum Demand and the Determination of Load Factor, Perry A. Borden. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 875-887, 14 figs. Determination of load factor with a view to rate making. Survey of present situation. Comparison of performance of a number of demand-measuring devices.

Maintenance of. Standard Maintenance in Power Plants, A. B. Stitzer. Elec. World, vol. 75, no. 13, Mar. 27, 1920, pp. 718-720, 2 figs. Deferred maintenance is shown to be an "expensive" economy. Systematic inspection and repair program is suggested. Relation existing between maintenance and reserve capacity is pointed out.

Mine-Mouth. Generating Plant at the Mouth of Mine, G. G. Bell. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 733-735, 5 figs. West Penn Power Co. leased coal mine that will provide Springdale station, ultimate rating 300,000 kw., with fuel for 50 years. Features of turbine-room apparatus are analyzed.

New England. Centralization and Conservation in Power Supply of Central Massachusetts, F. L. Hunt. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 947-959, 19 figs. How by closing down 121 isolated and using central stations supply nearly 40,000 tons of coal were saved in one year.

Development in New Hampshire and Vermont. Elec. World, vol. 74, no. 16, Oct. 18, 1919, pp. 833-835, 1 fig. Locations of electric generating stations, substations and transmission lines. Possible connections with Connecticut systems.

The New England Power Company, E. A. Dillard and H. R. Wilson. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 974-979, 5 figs. Developments of system. Energy is transmitted about 300 miles at 66,000 volts and normal week-day output averages 1,100,000 kw-hr. and normal week-day peak averages 80,000 kw.

New Jersey Public Service Electric Co. Prominent Power Plants, T. W. Stinson. Universal Engr., vol. 31, no. 2, Feb. 1920, pp. 23-27, 3 figs. Notes on power plant of Public Service Electric Co. of New Jersey, which furnishes electric light and power for domestic and commercial uses as well as power for street railways in most of the principal cities of the state. Generating stations, eighteen in number, have capacity of 278,205 kva. and are interconnected by approximately 950 miles of transmission lines operating at 13,200 volts and 26,400 volts.

Newcastle-upon-Tyne. A Modern Power Station and Its Development. Colliery Guardian, vol. 119, no. 3097, May 7, 1920, pp. 1285-1286, 1 fig. Deals with development which has taken place in connection with generating plant installed by Newcastle-upon-Tyne Electric Supply Co., Ltd., for supply of electricity. Includes table showing technical characteristics of various stages. Abstracts of paper by J. S. Watson read before Northeast Instn. Engrs. & Shipbuilders and discussion.

Nitrate Plant. Electrical Energy Supply for Nitrate Plant, C. D. Gray and E. Hagenlocher. Elec. World, vol. 74, no. 20, Dec. 13, 1919, pp. 1052-1055, 3 figs. Electrical machines are arranged to facilitate straight copper runs; storage battery is to carry vital loads in case of complete generator shut-down.

Pacific Northwest. Electric Power Development in the Pacific Northwest. Elec. Rev. (Chicago), vol. 76, no. 20, May 15, 1920, pp. 806-822, 24 figs. Principal hydroelectric and steam-electric plants. Central-station construction, equipment, operating features, transmission lines and power distribution systems in that section.

Parallel Operation. Electric Power Measurement with Respect to Phase-Displacement (Elektrische Arbeitsmessung unter Berücksichtigung der Phasenverschiebung), H. Bussmann. Elektrische Kraftbetriebe und Bahnen, vol. 17, nos. 23, 25 and 26, Aug. 4, Sept. 4, and 14, 1919, pp. 181-183, 193-197 and 201-205, 17 figs. KVA-tariff. Vector diagram of current passing through connecting cable. Most economical phase displacement of two power plants working in parallel according to Brecht.

Governor Adjustment for Efficient Parallel Operation, F. Oppenheimer. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 239-240, 9 figs. Principles of operating steam and hydroelectric plants in parallel and methods of changing governor regulations while running.

Power Station, Glasgow. Dalmarnock Power Station, Glasgow, Ernest G. W. Souster. Concrete & Constructional Eng., vol. 15, no. 1, Jan. 1920, pp. 7-19, 13 figs. Station will be of reinforced-concrete structure with storage capacity of 75,000 tons of coal. Feature especially noted is transporter which runs from end to end of storage plant and is arranged to permit coal being deposited or lifted from any part of storing plant and conveyed to overhead bunkers in boiler house.

Protection. Relay Protection for Large Power Stations, O. C. Traver. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 885-899, 29 figs. Describes recent developments and importance in design and construction of relays and indicates variety of results which can be accomplished by their combinations.

Railway Power Station. An Australian Electric Railway Power Plant. Power Plant Eng., vol. 24, no. 12, June 15, 1920, pp. 595-599, 9 figs. When completed, will have capacity of 60,000 kw. and supply power to 335 mi. of electrified steam railway.

Records. Daily Records of Plant Costs and Efficiencies, J. N. Strike. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1 and 8, 1919, pp. 870-

874, 4 figs. System of records followed in 20,000-kw. power plant, which is said to reveal operating conditions daily, thereby permitting immediate action to stop losses.

Sewage Gas as Fuel. See SEWAGE DISPOSAL, Gases, Utilization of.

Short Circuiting. Calculating Short Circuits on Power Systems, R. F. Gooding. Elec. World, vol. 74, no. 16 and 18, Oct. 18 and Nov. 15 and 22, 1919, pp. 827-830 and 938-941, 7 figs. Oct. 18: Scheme for investigating 3-face symmetrical short circuits is worked out. Nov. 15 and 22: Case of three large stations to be operated in parallel.

Effects of Short-Circuits on Power House Equipment, E. G. Merrick. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 935-941, 9 figs. Attention is called to problems created in properly handling vast amounts of energy which interconnection of power systems has created. In dealing with this class of problems writer analyzes troubles which are likely to occur in power house equipment due to electromagnetic stresses and abnormal temperatures resulting from short circuit.

Southern California. Southern California Edison Co.'s Power System, W. A. Scott. Elec. Rev. (Chicago), vol. 76, no. 20, May 15, 1920, pp. 798-805, 10 figs. General outline of power plants, water-storage facilities, transmission lines and distribution system, with details of important construction, operating and service features. Energy-producing capacity amounts to 203,000 kw., of which 117,000 kw. is furnished by hydroelectric stations and 86,000 kw. by steam-driven generators.

Stability. Stability of High-Power Generating Stations, Charles P. Steinmetz. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 554-556. Discusses power limitation devices and parallel operation of synchronous machines.

Steam. See STEAM-ELECTRIC PLANTS.

Stock Rooms. Caring for the Stock. Jl. Electricity, vol. 43, no. 11, Dec. 1, 1919, pp. 503-505, 4 figs. Stock-room devices used by Pac. State Elec. Co.

Swiss, Consolidation of. The Consolidation of Power Plants for the Purpose of Increasing Utilization of Energy (Der Zusammenschluss der Kraftwerke zum Zwecke erhöhter Energieausnützung), Bruno Bauer. Schweizerische Bauzeitung, vol. 75, no. 15, April 10, 1920, pp. 165-170, 7 figs. Discussion of the proposed scheme of the Zürich Assn. of Architects and Engrs. for the combination of all plants into one extended system of high-tension lines of great capacity, and also the combined utilization of all electric energy and opening up of new power sources. Paper read before the Zürich Assn. of Architects and Engrs.

[See also CENTRAL STATIONS; COMPRESSED AIR, Hydroelectric Plants; HYDRO-ELECTRIC PLANTS; RESERVOIRS, North Carolina; STEAM-ELECTRIC PLANTS; SUB-STATIONS; SWITCHBOARDS; SWITCHES; WATER POWER.]

ELECTRIC POWER

Basis for Rates. Establishing Simple Basis for Rates, Ray H. Wolford. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 382-383, 3 figs. Measurement of kilovolt-ampere-hours and kilovolt-amperes maximum demand in polyphase circuits by use of standard polyphase watt-hour meters is suggested as simple basis on which to figure rates.

Cost to Consumer. Rate of Charging for Electrical Energy (Tariffe e Coefficenti di Prezzo per la Vendita dell'Energia Elettrica), V. Vittorelli. Elettrotecnica, vol. 7, no. 7, Mar. 5, 1920, pp. 106-110, 2 figs. Mathematical formula for computing rate at which energy must be sold to consumer in terms of power generated, capital invested and expenses of operation.

Direct Generation From Fuel. Direct Generation of Electric Power from Fuels (Die unmittelbare Erzeugung elektrischer Kraft aus Brennstoffen), H. Pradel. Elektrotechnischer Anzeiger, vol. 36, nos. 151, 152-153, 154-155 and 156-157, Dec. 20, 23, 25 and 31, 1919, pp. 721-724, 727-728, 732-734 and 740-742, 17 figs. Details and illustrations of various types of apparatus patented in Germany and other countries.

Farms, Advantages for. Transmitted Power for the Farm, F. C. Van Etten. Armour Engr., vol. 11, no. 3, March 1920, pp. 195-207, 6 figs. Advantages of transmitted power over individual plant are enumerated, and economical features of electric transmission line for farm surveys are discussed.

Japan. The Question of Electric Power Supply in Europe and Its Solution in Japan (in Japanese), E. Aovagi. Denki Gakkwai Zasshi, no. 379, Feb. 10, 1920. Paper read before meeting of Kwansai local section of Japanese Elec. Soc.

Long-Distance Transmission. Conditions of Maximum Efficiency of Long Distance Electric Power Transmission (Des conditions optima à remplir par les constantes d'une ligne de transport d'énergie à grande distance pour une charge donnée à l'arrivée. Solutions pratiques), A. Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 18, May 3, 1920, pp. 1032-1037. Method outlined in Comptes rendus, vol. 170, 1920, p. 978, is applied to various practical cases.

Limits of Alternating Current Power Transmission (Ueber die Grenzen der Kraftübertragung durch Wechselströme), Elektrotechnischer Anzeiger, vol. 36, no. 75, July 22, 1919, pp. 349-350. Comparison of advantages and disadvantages of d. c. and a. c. for long distance transmission.

The Development of Long Distance Electric Power Transmission, Paul M. Lindoln. The J. E. Aldred Lectures on Engineering Practice, 1919-1920. Johns Hopkins University, Dept. of Eng., 1920, pp. 197-225.

Meter Rates. Standard Meter Rates, LeRoy W. Allison. Power, vol. 51, nos. 5, 6 and 7, Feb. 3, 10 and 17, 1920, pp. 183-184, 218-219 and 257-259, 6 figs. Fundamental features of power-plant operation are discussed as regards rates, with consideration of station load, load factor, diversity factor, etc. Discussion of meter rates, including straight-line, step, and block meter rate. Demand-rate systems are discussed and examples are given to show how these rates are applied in calculating bills.

Transmission of. Power Transmission by Gas, Times Eng. Supp., no. 541, Nov. 1919, pp. 331. Comparison with electricity.

Wartime Supply. Electric Power Supply During the Great War, Arnold B. Gridley and Arnold H. Human. Jl. Instn. Elec. Engrs., vol. 57, no. 285, Aug. 1919, pp. 541-546. Electrical plant manufactory.

ELECTRIC RAILWAY SIGNALS

Dual Control. Dual Control Signals on the Pacific Electric, Clifford A. Elliott. Elec. Ry. Jl., vol. 56, no. 7, Aug. 14, 1920, pp. 321-322, 4 figs. Improved type of signal-light circuit adopted for single-track line to minimize hazardous operating conditions.

ELECTRIC RAILWAYS

Austria. The Electrical Operation of the Austrian State Railroads (Elektrischer Betrieb der deutsch-österreichischen Staatsbahnen), H. Trautvetter. Elektrotechnische Zeitschrift, vol. 41, no. 3, Jan. 15, 1920, pp. 51-52. Recom-

mendation of Austrian chief state councillor to employ alternating current of 50 cycles to be supplied by outside power plants is adversely criticised, and it is maintained that economic operation is possible with power supplied by railroad plants. The latest developments in construction of electric locomotives for the Prussian State Railroad are described.

Braking, Regenerative. Electric Braking of Direct-Current Vehicles, W. M. Hutchinson. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 471-473, 5 figs. Fundamental principles involved.

Relative Saving in Energy Through Regenerative Braking on Electric Railways (Die relative Energie-Ersparnis durch die Nutzbremsung bei elektrischen Bahnen), W. Kummer. Schweizerische Bauzeitung, vol. 75, no. 11, Mar. 13, 1920, pp. 121-122, 2 figs. It is pointed out that in the determination of the recovery of energy with regard to the annual cost of energy, consideration must be taken not only of the relative saving but also of relative increase of fluctuating condition of outputs, but that nevertheless the economic success of recovery is apparent.

The Alternating-Current Shunt Machine as Motor and Regenerative Brake (Die Wechselstrom-Nebenschlussmaschine als Motor und Nutzbremse), Gustav Benischke. Elektrotechnik u. Maschinenbau, vol. 38, no. 7, Feb. 15, 1920, pp. 69-72, 3 figs. Writer calls attention to impracticability of series motor for regenerative braking and recommends use of shunt motor in spite of its disadvantages, because of great importance under present-day conditions of the recovery of electric motive power in the brake operation of electric railways. Reference is made to the Behn-Eschenburg article on shunt motors, published in this journal (1918, p. 553), with special regulation of stator voltage and rotor voltage.

The Recovery of Current with Alternating Current Railways (Stromrückgewinnung bei Wechselstrombahnen), M. Schenkel. Elektrotechnische Zeitschrift, vol. 41, nos. 28 and 29, July 15 and 22, 1920, pp. 542-544 and 567-571, 26 figs. Discusses advantages and disadvantages of regenerative braking with aid of practical examples. Notes on elimination of self-excitation phenomena and creation of a good power factor. Curves showing operating characteristics of the different connections, indicating especially how tractive power, power factor and efficiency vary with speed and the influence of voltage regulation on main transformer of alternating current locomotive.

California. California and Her Tractions, Edward Hungerford. Elec. Ry. Jl., vol. 56, no. 11, Sept. 11, 1920, pp. 490-493, 2 figs. Comment on electric roads in Southern California and in Oakland district. Traffic is increasing and automobile competition shows signs of diminishing.

Car-Energy Saving. Economical Use of Energy for Car Purposes, D. D. Ewing. Elec. Ry. Jl., vol. 55, no. 13, Mar. 27, 1920, pp. 641-643. Possibilities in way of energy saving lie, it is said, in use of lighter cars and proper operating methods and of equipment properly applied to service which it is to perform.

How Meters Induce Car-Energy Savings, L. E. Gould. Elec. Ry. Jl., vol. 55, no. 13, Mar. 27, 1920, pp. 644-646. Because, it is said, meters give motormen full credit for operating on full multiple position, and penalize them for running on resistance notches. Paper read before Central Elec. Ry. Assn.

The Efficiency Mileometer, C. H. Koehler. Elec. Ry. Jl., vol. 55, no. 13, Mar. 27, 1920, pp. 639-640. Construction of device which records difference between power-on and power-off privilege as well as total mileage. Paper read before Central Elec. Ry. Assn.

Cars. See CARS, Electric.

Conductor Rails. Electric Railway Contact Systems, Sir Philip Dawson. Electrician, vol. 85, no. 2200, July 16, 1920, p. 79 and (discussion) p. 80. Discussion of conductor rails.

Coney Island Terminal Project. Handling Coney Island's Crowds. Elec. Ry. Jl., vol. 55, no. 4, Jan. 24, 1920, pp. 186-190, 21 figs. General layout of elevated and subway terminal project.

Contact Systems. Electric Railway Contact Systems, Phillip Dawson. Tramway and Ry. World, vol. 48, no. 14, Sept. 16, 1920, pp. 143-148, 13 figs. Principles of overhead conductors. Paper read before Instn. of Elec. Engrs.

Depreciation Reserves for. Need of Depreciation Reserves, Williston Fish. Aera, vol. 8, no. 6, Jan. 1920, pp. 699-708. Decisions of courts and commissions. Opinion is expressed that there is no good reason why depreciation reserves should not be established by all electric railways.

Design, Maintenance and Operation. Design, Maintenance and Operation of Electric Rolling Stock. Elec. Ry. Jl., vol. 55, no. 24, June 12, 1920, pp. 1200-1205. Summary of present practices, symposium of papers read at Mechanical Section Convention of Am. Ry. Assn.

Direct-Current Systems. Direct-Current Systems of Electric Traction Feeding of Tramway and Underground-Railway Networks (Études sur la traction électrique par courant continu. Alimentation des réseaux de tramways et de métropolitains), M. Guéry. Bulletin de la Société Française des Électriciens, vol. 9, no. 83, Aug.-Nov. 1919, pp. 509-554, 15 figs. Equations and curves for determining specific consumption of energy, efficiency, and other characteristics, together with exposition of procedure to determine mean value of current to be supplied to circuits and considerations relative to networks in which locomotives are designed with regenerative tracks.

Effect of Transportation Act of 1920 on. The Transportation Act of 1920, Charles L. Henry. Aera, vol. 8, no. 9, Apr. 1920, pp. 993-998. How provisions of section 422 of new railroad law affect interurban electric railways.

Express Service. Electric Railway Express Service, C. J. Munton. Elec. Traction, vol. 15, no. 12, Dec. 15, 1919, pp. 808-810 and (discussion) 810-815. Replies to questionnaire sent to various companies in which they were asked to outline method by which they provide express service. Paper read before Central El. Ry. Assn.

Federal Commission Report. Federal Commission Report. Elec. Ry. Jl., vol. 56, no. 9, Aug. 28, 1920, pp. 398-411. Full text of report. Scope of inquiry was to ascertain actual financial and service condition of electric railways of United States at present, causes which have contributed to such conditions, what readjustments of relations between electric railways and communities which they serve must be brought about in order to restore confidence of public and to put companies upon such financial basis for future as will enable them to render continuous and efficient service to their respective communities.

Flywheel Effect in Braked Cars. Transference of Load in Cars while Braking, T. F. Burke. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 750-752, 3 figs. Methods used in calculating "fly-wheel" of rotating parts of electric car equipment and explanation of how load is transferred throughout train during retardation period.

Freight Service. Heavy Freight Service on a Single-Track, High-Speed Passenger Line, A. B. Cole. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 866-868, 7 figs. Dispatch, merchandise and steam road interchange freight

service interspersed with frequent multiple-unit passenger trains.

The Electric Railway vs. Freight Congestion, T. H. Stoffel. Elec. Traction, vol. 16, no. 4, Apr. 15, 1920, pp. 253-256, 3 figs. Writer claims the most urgent needs at this time of electric lines engaged in freight handling, are increased terminal facilities and freight equipment, especially trailer cars.

Freight Traffic. Electrified Canadian Road Demonstrates Advantages of Freight Traffic, Arthur C. Carty. Elec. Traction, vol. 16, no. 6, June 1920, pp. 391-397, 8 figs. Method of handling shipments.

Hazards. Electric Railway Hazards—Causes, Effects and Remedies, R. E. McDougall. Elec. News, vol. 28, no. 24, Dec. 15, 1919, pp. 36-37. Based on records of New York State railways. Paper read before Nat. Safety Council.

Initial Acceleration and Efficiency. Theoretical Importance of Initial Acceleration on Efficiency of Interurban Railways (Die theoretische Bedeutung der Anfahrtsbeschleunigung für die Leistungsfahigkeit einer Stadtschnellbahn), D. Otto Christiansen. Annalen für Gewerbe und Bauwesen, vol. 85, no. 4, Aug. 15, 1919, pp. 25-29, 6 figs. Mechanics of starting.

Interurban. Cutting Down Operating Expenses on a Small Interurban Road, C. T. Dehore. Elec. Ry. Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 915-918, 6 figs. Examples of eliminating useless material, reducing labor cost and speeding up cars.

The Possibilities of Interurban Railroads, Britton I. Budd. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 637-641, 9 figs. Possibilities of furnishing better freight service at higher than steam road rates.

Iron Trolley Wire. Overhead Practice and Experience in Atlanta. Elec. Ry. Jl., vol. 55, no. 12, Mar. 20, 1920, pp. 563-565, 3 figs. It is said that iron trolley wire has been used with success on city line.

Logging Industry. Electric Railways and Electricity For Logging Roads, John B. Woods. Elec. Traction, vol. 16, no. 5, May 1920, pp. 311-316, 6 figs. Possibilities of electric railways as logging roads and use of electric power thus made available in woods.

Maintenance. Results of Twelve Years of Electric Operation, R. L. Hermann. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 603-604. Experience of Grand Trunk Railway in maintenance of equipment.

Management. Revised Schedules Bring Gain. Elec. Ry. Jl., vol. 55, no. 10, Mar. 6, 1910, pp. 478-480, 5 figs. Methods used by International Railway of Buffalo for determining number of cars required and drafting timetables.

Motor-Armatures Overloads. Effect of Short-Time Overloads on Railway Motor Armatures, J. K. Stotz. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 473-474, 2 figs. Graphs showing comparative temperature rises on field coils of ventilated and non-ventilated motors having same continuous capacity.

Motors. Maintaining Electric Railway Motors, John S. Dean. Elec. Ry. Jl., vol. 55, no. 20, May 15, 1920, pp. 990-992, 5 figs. Practices for babbitting bearings and dipping and baking armatures are discussed, with suggestions for proper equipment necessary in this work.

New Equipment for the Philadelphia Electrification, Walter H. Smith. Elec. Ry. Jl., vol. 55, no. 24, June 12, 1920, pp. 1207-1211, 11 figs. Motor is of commutating-pole type and control provides for protection without circuit breakers on cars. Specially designed screens are used to exclude dust from motors.

The Drive Conditions for Electric Traction and the Types of Current Employed (Die Antriebsbedingungen für elektrische Zugförderung und die Stromarten), A. Marschall. Elektrotechnische Rundschau, vol. 37, nos. 8, 9 and 10, Apr. 21, May 5 and 19, 1920, pp. 37-38, 41-42 and 45-46, 2 figs. Includes chart showing mechanical characteristics of different types of motors with the same normal tractive force and speed, which it is claimed is best manner of illustrating the special conditions under which the electric motor operates in trunk lines.

Transformer Action of Tapped Field Railway Motors, C. W. Squier. Elec. Ry. Jl., vol. 55, no. 8, Feb. 21, 1920, pp. 383-385, 3 figs. Graphs indicating how necessary gaps in third-rail construction cause an opening and closing of supply circuit to electric cars with a resulting inductive effect in field and armature windings of motors.

Multiple-Unit Equipment. Multiple Unit Equipment for English Railway. Ry. Elec. Engr., vol. 11, no. 2, Feb. 1920, pp. 49-53, 7 figs. All-steel electric cars designed for operation from 1200-volt third rail.

Multiple-Unit Train Control. The Zweigbergk System of Multiple-Unit Train Control. English Elec. Jl., vol. 1, no. 1, Jan. 1920, pp. 21-26, 4 figs. Reduction in size and weight achieved in improved form of control gear developed by Mr. Zweigbergk and manufactured by English Electric Co., Ltd., is said to be attained by so arranging circuits that majority of contactors are not required to break current at all, and by controlling their movements collectively by motor-operated camshaft instead of by individual solenoids.

Multiple-Unit Train Operation. Multiple-Unit Control Equipments, H. R. Meyer. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 464-469, 14 figs. Types used on Cleveland Interurban Railway Co.

Multiple-Unit Train Operation, S. B. Schenck. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 457-460, 6 figs. Types of multiple-unit controls.

New York State. Electric Railways of New York State. Elec. Ry. Jl., vol. 54, no. 14, Oct. 4, 1919, pp. 688-690. Report of conference of executives on condition of industry held at Syracuse on Sept. 18 under auspices of "Committee of Ten," New York Elec. Ry. Assn.

Oklahoma. New Interurban Railway in Oklahoma. Elec. Ry. Jl., vol. 56, no. 10, Sept. 4, 1920, pp. 449-453, 17 figs. Serves activities of oil fields. Built cross-country, with 2-deg. curves and 1 per cent maximum grade and concrete bridges designed for heavy loads, looking to future freight business.

Operation. Operating a 14-Mile Suburban Line on a Thirty-Second Headway. Elec. Ry. Jl., vol. 55, no. 26, June 26, 1920, pp. 1305-1307, 4 figs. Safety record, it is stated, has been established by Philadelphia Rapid Transit Co. on line whose natural characteristics impose several service operating difficulties. Supervision methods are explained.

Severe Winter Operating Conditions, John S. Dean. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 438-443, 14 figs. Practical methods for minimizing possible troubles.

Stores Service Has Unrealized Possibilities, M. T. Montgomery. Elec. Ry. Jl., vol. 56, no. 2, July 10, 1920, pp. 62-64, 2 figs. Said to be a vital element of an operating company, generally overlooked. Illustrations of organization chart and calendar used in Pittsburgh railway stores.

The Scientific Arrangement of Schedules, Edward Dana. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 647-651, 7 figs. Close relation of efficient schedules to economical opera-

tion. Eight-hour-day problem as worked out on Boston Elevated Railway.

Peak-Load Transportation. Handling Shipyard Traffic at Sparrows Point, L. H. Palmer. Elec. Ry. Jl., vol. 55, no. 19, May 8, 1920, pp. 930-935, 11 figs. Construction and operation of double track spur in order to solve difficulties of peak-load transportation.

Plight of. The Plight of the Electric Railways, Warren G. Harding. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 155-157. Problems of capital and labor are analyzed and it is observed that no industry has been worse penalized by war than electric railways.

Power Economies. Coasting Recorders Give Striking Results, J. E. Heberle. Elec. Ry. Jl., vol. 56, no. 4, July 24, 1920, pp. 179-180. Experience of one year on lines of Capital Traction Co. indicates savings in all directions. Transportation department must take active interest to realize fully on power-saving installations.

Power-Station Economy. Handling 50 Per Cent Greater Power Station Load with Nine Men Less. Elec. Ry. Jl., vol. 55, no. 7, Feb. 14, 1920, pp. 322-324, 6 figs. Experience of plant after installing stokers and coal and ash-handling and storage facilities.

Power Stations. See ELECTRIC PLANTS, Railway Power Stations.

Production and. Electric Railways in Relation to Production, John P. Pardee. Aera, vol. 8, no. 10, May 1920, pp. 1089-1095. Coördination of all means of transportation is urged. Discussion of electric railway operation as it affects production. Presidential address delivered before U. S. Chamber of Commerce.

Protection of Electrical Equipments. Methods of Protecting Electrical Equipments, Lynn G. Riley. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 453-456, 12 figs. Methods of protecting electrical equipments on cars and locomotives.

Regenerative Braking. See Braking, Regenerative.

Remedial Legislation for. To Preserve Electric Railways. Aera, vol. 8, no. 5, Dec. 1919, pp. 594-595. Recommendations of committee appointed by Massachusetts legislature to suggest remedial legislation in connection with electric railways.

Repair Shops. Completion of Pacific Electric Company's Shops at Torrance, Clifford A. Elliott. Elec. Traction, vol. 16, no. 1, Jan. 1920, pp. 1-4, 8 figs. Attention is called specially to sanitation, ventilation and other features in interest of employees' welfare.

Rolling Stock, 1919. 2,447 New Cars and Locomotives Ordered in 1919. Elec. Ry. Jl., vol. 55, no. 1, Jan. 3, 1920, pp. 49-52, 1 fig. Following statements are made: Numbers of cars ordered from manufacturers and built in shops of various electric railway companies are approximately the same as in last two years; safety cars show more than 100 per cent increase.

Rolling-Stock Inspection. Basing Car Inspection on Energy Consumption, L. E. Gould. Elec. Ry. Jl., vol. 56, no. 6, Aug. 7, 1920, pp. 267-269. Advantages of this system over mileage or time basis pointed out. System is said to be flexible, accurate and to control length of inspection period according to work done. Paper read before Illinois Elec. Rys. Assn.

Rural Line Extensions. Data on Rural Line Extensions. Elec. Rev. (Chicago), vol. 76, no. 14, Apr. 3, 1920, pp. 561-564. Results of investigations of representative rural line installations by Railroad Commission of Wisconsin, with draft of rules for proper handling of rural service by central-station companies formulated by Committee on Rural Line Extensions of Wisconsin Electrical Association.

Signals. See ELECTRIC RAILWAY SIGNALS.

Snow Removal. Maintenance Account No. 12—Removal of Snow, Ice and Sand, R. C. Cram. Elec. Ry. Jl., vol. 55, no. 13, March 27, 1920, pp. 634-636, 4 figs. Principal feature is said to be to prevent accumulation of snow and it is added that delay in attack causes more failures than anything except inadequate equipment.

See also SNOW PLOWS; SNOW REMOVAL; SNOW SWEEPERS.

Starting Acceleration, Efficient Value of. Theoretical Importance of Starting Acceleration with Regard to Efficiency of a City Rapid Transit Railway (Die theoretische Bedeutung der Anfahrbeschleunigung für die Leistungsfähigkeit einer Stadtschnellbahn), Otto Christiansen. Annalen für Gewerbe und Bauwesen, vol. 85, nos. 5 and 6, Sept. 1 and 15, 1919, pp. 33-36 and 41-45, 11 figs. Curves are presented showing effect of acceleration on clearance time, or time required by train stopping in station from moment of starting until its last axle has reached clearing point back of out signal. Value of starting acceleration in case of irregularities in schedule caused by delays is pointed out.

Statistics of Industry. Statistics of the Electric Railway Industry. Elec. Ry. Jl., vol. 55, no. 1, Jan. 3, 1920, pp. 55-56. Figures are given by states and districts of track mileage and rolling stock owned.

Suburban Lines. Maintenance of Single-Phase A. C. Multiple-Unit Equipment on the Westchester. Elec. Ry. Jl., vol. 55, no. 24, June 12, 1920, pp. 1193-1199, 14 figs. Inspection and maintenance practice on a high-speed suburban line, together with data covering costs of such inspection and maintenance.

Substations. See SUBSTATIONS, Automatic.

Supplying Parts to Repair Shops. Supplying Repair Parts to Shops, W. G. Murrin. Elec. Ry. Jl., vol. 56, no. 2, July 10, 1920, pp. 85-86, 1 fig. Canadian company replaces worn-out supply car with auto truck; sends salvage car monthly over interurban division. Advantage of plan is that it enables foreman in each repair shop to accumulate pieces for repair until a man or machine can do the work in quantities and so reduce unit cost.

Track. See ELECTRIC RAILWAYS, TRACK.

Train Schedules for. Direct-Current Electric Traction Feeding of Tramways and Underground Networks (Étude sur la traction électrique par courant continu; alimentation des réseaux de tramways et de métropolitains), F. Guéry. Revue générale de l'Électricité, vol. 7, no. 6, Feb. 7, 1920, pp. 179-192, 11 figs. Technical considerations involved in preparation of train schedule.

Trolley Freight in New England. Trolley Freight in New England, R. E. Cosgrove. Elec. Ry. Jl., vol. 55, no. 4, Jan. 24, 1920, pp. 197-199. Business is said to be constantly growing in spite of motor-truck competition and to amount now to more than $2,000,000 per year. Writer gives suggestions regarding equipment, schedules and other details.

Trolley Wires, Ice-Covered. Formulæ for Ice-Covered Trolley Lines (Aneisungsformeln), Robert Edler. Schweiz. elektrotechnischer Verein, vol. 11, no. 9, Sept. 1920, pp. 219-237, 12 figs. Includes tables of standards of the Assn. German Engrs. (V. D. I.) for 1914 and 1919, and Swiss regulations for the additional load caused by ice and snow deposits. It is maintained that problem of additional load can only be solved by standard, systematic tests. Bibliography.

Trolley Wires, Sag of. Determination of the Sag

in Catenary Trolley Lines and Their Automatic Tightening (Bestimmung des Durchhanges bei Kettenfahrleitungen und deren selbsttätige Nachspannung), C. Wlach. Elektrotechnische Zeitschrift, vol. 41, no. 18, May 6, 1920, pp. 347 and 352-354, 6 figs. Method for calculation of relations between sag and wire tension with varying temperatures and loads.

[See also RAILWAY ELECTRIFICATION; STREET RAILWAYS.]

ELECTRIC RAILWAYS, TRACK

Bonding Rails. Bonding in Special Locations, G. H. McKelway. Elec. Ry. Jl., vol. 56, no. 8, Aug. 21, 1920, pp. 355-359, 5 figs. Methods of cross-bonding and of effecting special connections to structures, bridges, and poles.

Return-Conductor in the Single-Phase Alternating-Current System of the French Southern Railway (Le conducteur de retour, du courant de traction sur le réseau a courant alternatif monophasé de la compagnie des chemins de fer du midi), M. J. Lhériaud. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs Civils de France, vol. 70, no. 4, Oct.-Dec. 1917, pp. 831-896, 28 figs. As result of investigations it was decided not to use electric bonds, but to ground rails to moist strata at regular intervals and to install a system of transformers for maintaining current in rails. Electric bonding, it was determined, is advantageous only when trains in line are at no time farther than about 2½ miles from a substation.

Soldered Bonds for Track Bonding, G. H. McKelway. Elec. Ry. Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 899-901, 8 figs. Types of soldered bonds.

See also Rail Joints.

Bonds. Using Brazed and Welded Bonds, G. H. McKelway. Elec. Ry. Jl., vol. 55, no. 16, Apr. 17, 1920, pp. 796-799, 10 figs. Various methods used with contact resistance, arc-weld and gas-weld rail bonding are described and some of troubles experienced are detailed.

Chrome-Nickel Steel vs. Manganese Steel. Solid Chrome Nickel Steel Special Trackwork. Elec. Ry. Jl., vol. 55, no. 16, Apr. 17, 1920, pp. 799-801, 5 figs. Description of a type of construction developed by Milwaukee company during war as a substitute for solid manganese, which is said to have some advantages and apparently good wearing qualities.

Current Losses. Current Losses in Electric Railway Tracks (Sur les pertes de courant qui se produisent le long des voies de tramways), G. Girousse. Revue générale de l'Electricité, vol. 8, no. 1, July 3, 1920, pp. 837-844, 10 figs. Simplifications of usual formulæ are suggested.

Economic Construction. Low-First-Cost Low-Maintenance-Cost Track. Elec. Ry. Jl., vol. 55, no. 12, Mar. 20, 1920, pp. 559-560, 3 figs. Construction of Tampa, Fla., Elec. Co., which comprises 5-in. A.S.C.E. 80-lb. rails laid on wood stringers supported on cross ties and making use only of sand for ballast and for track and paving foundations.

Labor-Hour Requirements. Estimating Labor Hour Requirements for Three Types of Street Railway Track Construction, D. B. Davis. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 239-240, 3 figs. Based on data obtained in construction of work at Richmond, Ind.

Maintenance. Auto Truck for Track Repairs, W. L. Whitlock. Elec. Ry. Jl., vol. 56, no. 3, July 17, 1920, pp. 134-135. Analysis of work done and cost of using a truck for emergency repair jobs and minor track maintenance.

Pressure Drop. The Calculation of Track Pressure Drop and Track Losses on Direct Current Electric Railways, F. F. P. Bisacre. Elecn., vol. 84, no. 2180, Feb. 27, 1920, pp. 214-216. Formulæ are derived for case when trains are spaced at regular intervals and method is suggested for extending their use to case when distances are not equal.

Rail Joints. Characteristics of Rail Bonds, Ralph H. Rice. Elec. Ry. Jl., vol. 55, no. 11, Mar. 13, 1920, pp. 523-526. Summary of present practice in this field with comment upon merits and demerits of important types of bonds now and previously in use. Paper read before Central Elec. Ry. Assn.

Methods and New Apparatus for Measuring Electric Resistance of Rail Joints (Methodes et nouveaux appareils de mésure électrique des joints de rails), G. Debaupin. Electricien, vol. 35, nos. 1252 and 1253, May 15 and June 1, 1920, pp. 193-197 and 219-225, 20 figs. May 15: Application of principle of differential galvanometer. June 1: Apparatus measuring resistance by method of double galvanometer.

Modern Methods of Prolonging Track Life, E. A. Hoffman. Elec. Ry. Jl., vol. 55, no. 25, June 19, 1920, pp. 1258-1260. Arc welding of rails followed by grinding is said to give joint life equal to that of rail. Bonding, roadbed construction and tie treatment are also taken up.

Modern Practice in the Construction and Maintenance of Rail Joints and Bonds in Electric Railways, E. R. Shepard. Technologic Papers of the Bureau of Standards, no. 62, 1920, 131 pp., 45 figs. Data collected in general survey of practices throughout United States are presented, present tendencies are interpreted and apparent inconsistencies and differences of opinion are reconciled. Information is presented with a view to establishing guide to selection of bonds and joints. Appendix is included in describing recent developments and improvements.

Progress in Rail Joint Construction, R. C. Cram. Elec. Ry. Jl., vol. 56, no. 9, Aug. 28, 1920, pp. 415-419. Opposite vs. staggered joints. Strength of electric bar-weld joints. Essentials for success of arc-weld type of joint.

See also ELECTRIC WELDING, ARC, Rails.

Rail Welding. Solving Track Problems at St. Joseph, H. L. Chaffee. Elec. Ry. Jl., vol. 55, no. 23, June 5, 1920, p. 1135, 3 figs. Thermit welding is said to have been used quite extensively to eliminate bolted joints and rail bending.

Return Feeders. Studies on Direct-Current Electric Traction Systems. Feeding of Networks of Tramways and of Underground Railways (Études sur la traction électrique par courant continu; alimentation des réseaux de tramways et de métropolitains), F. Guéry. Revue générale de l'Électricité, vol. 7, no. 7, Feb. 14, 1920, pp. 222-239, 13 figs. Calculations involved in design of return feeders are illustrated and economical aspect of installing motors provided with regenerative brakes is discussed.

Tie Rods. Tie Rod Specifications Assist in Reducing Failures, Howard H. George. Elec. Ry. Jl., vol. 55, no. 13, Mar. 27, 1920, pp. 655-656, 2 figs. Specifications for tie rods used by Public Service Railway of New Jersey are given with comments on their essential features.

[See also STREET RAILWAYS, Track Construction.]

ELECTRIC RANGES

Types. Electric Ranges, C. W. Piper. Purdue University Publications Eng. Depts., vol. 3, no. 1, March 1919, 40 pp., 33 figs. Characteristics of different types of electric ranges. Data on cost of baking with electricity. Comparative study of electric ranges with both coal and gas ranges.

ELECTRIC RESISTANCE

Contact. See CONTACTS.

Inductionless. A Form of Inductionless High Resistance, N. W. McLachlan. Radio Rev., vol. 1, no. 9, June 1920, pp. 429-431, 3 figs. Solution of cadmium iodide in amyl alcohol used at Nat. Physical Laboratory, England.

Measurement. On the Measurement of Changes in Resistance by a Valve Method, R. T. Beatty and A. Gilmour. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 40, no. 237, Sept. 1920, pp. 291-295, 5 figs. Experimental results.

The Measurement of Small Resistances with Insulation Magnetos Generators (Die Messung kleiner Widerstände mit Magnet-Isolationsinduktoren), Willibald Fuhrmann. Elektrotechnische Zeitschrift, vol. 41, no. 23, June 10, 1920, pp. 452-453, 2 figs. Describes method for measurement whereby a portable insulation magneto is used in connection with a milliammeter; in order to obtain as accurate measurements as possible, the efficiency of magneto should increase with decrease in sensibility of milliammeter.

See also WHEATSTONE BRIDGE.

ELECTRIC SHOVELS

See COAL HANDLING, Electric Shovel; EXCAVATION, EARTH, Electric-Shovel.

ELECTRIC SWITCHES

Carrying Capacity. The Carrying Capacity of Switch Apparatus of High Frequency, Especially of Drum Starters (Ueber die Belastungsfahigkeit von Schaltapparaten hoher Schalthäufigkeit, insbesondere von Steuerwalzen), Heinrich Ott. Elektrotechnische Zeitschrift, vol. 40, no. 46, Nov. 13, 1919, pp. 583-585, 3 figs. Writer claims there has been little investigation of switch apparatus, and presents new formulæ for dependence of starting power on current and voltage as well as dependence of switch frequency on switch power. Treats of conditions with use of substitute metals and of the particular influence of a.c. voltage on carrying capacity.

Disconnecting. Calculation of Magnetic Force on Disconnecting Switches, H. B. Dwight. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 550-552, 5 figs. Formulæ and graphs.

Enclosing, Regulations for. Protect Workmen by Inclosing Switches, A. Waldschmidt. Elec. World, vol. 75, no. 13, Mar. 27, 1920, pp. 729-731, 4 figs. It is said that records show that exposed switches have been responsible for many accidents. Features of typical inclosed switches are discussed as well as rules regulating use of switches advanced by cities of Chicago and Detroit and various industrial commissions and Home Office regulations for factories and workshops in Great Britain.

High-Capacity. High-Capacity Electric Switches (Ueber Hochleistungsschalter), J. Biermanns. Elektrotechnische Zeitschrift, vol. 41, no. 17, Apr. 29, 1920, pp. 325-326, 3 figs. Results of theoretical and experimental investigations on an A.E.G. switch with a 60,000 kva. generator.

High-Power Switches (Ueber Hochleistungsschalter), F. Schrottke. Elektrotechnische Zeitschrift, vol. 40, no. 49, Dec. 4, 1919, pp. 625-630, 17 figs. After explaining dangerous qualities of oil-break switches in general use, design and operation of high-power switches of Siemens-Schuckert Works are described, and account is given of short-circuit experiments with such switches on an alternating-current generator of 60,000 kva., 7000 volts. Address read before Electrotechnical Assn.

High-Power Switches (Ueber Hochleistungsschalter), Max Vogelsang. Elektrotechnische Zeitschrift, vol. 40, no. 47, Nov. 20, 1919, pp. 597-600, 10 figs. Phenomena in connection with oil-break switches are discussed and points to observe in construction are derived. Writer points out practicability of oil-break switches for continuous current and describes their construction for large currents with the aid of several examples. Address read before Electrotechnical Assn.

High-Tension. A High-Tension Oil-Break Switch with Precompression (Hochdruckölschalter mit Vorkompression D.R.P.), P. Bendmann. Elektrotechnischer Anzeiger, vol. 36, no. 92, Aug. 31, 1919, pp. 429-430. Among advantages pointed out are precompression at 4-5 atmost gage, security against loss of oil, efficient insulation, security against higher pressure that 5 atmos., etc.

High Voltage Power Transmission Problems, W. W. Lewis. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 927-934. Examples of application of formulæ developed by Steinmetz (See Gen. Elec. Rev., June 1913). It is visualized that voltages and length of line will soon be reached where it will be necessary to employ rigid hyperbolic formulæ.

High-Tension Air-Brake. Switching on the World's Longest Line. Elec. World, vol. 75, no. 8, Feb. 21, 1920, pp. 421-423, 3 figs. Method employed by Southern Sierras Power Co. to provide for 140,000-volt air-brake switches on each end of its 348-mile transmission system.

Oil. Maljournal-Bourron Compression Chamber Oil Interrupter (Disjoncteur Maljournal et Bourron à chambres de compression), P. Charpentier. Revue générale de l'Électricité, vol. 8, no. 7, Aug. 14, 1920, pp. 211-215, 5 figs. Combination of compression chamber and mechanism providing rapid opening of circuit.

Oil Circuit Breaker Arrangements and Switching Schemes for Steel Mills, G. P. Wilson. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 402-410, 15 figs. Schematic diagram of power plants and mill equipment located in five separate mills of one large company.

Oil Switches for Large Electrical Supply Systems. Engr., vol. 130, no. 3375, Sept. 3, 1920, pp. 220-222, 9 figs. Critical study of present designs.

Oil Switches with Series Reactances (Oelschalter mit Vorschaltreaktanzen). Elektrotechnischer Anzeiger, vol. 36, no. 104, Sept. 28, 1919, pp. 491-492, 1 fig. Deals with combating waves set up on closing suites by series resistance and with extending the switching operation over two stages.

The Phenomena of Switching in Oil and the Possibilities of Standardizing the Apparatus, P. Charpentier. Elecn., vol. 84, no. 2196, June 18, 1920, pp. 668-670. Paper read before Union des Syndicats de l'Électricité. This organization is about to draw up standard rules for oil switching apparatus. Lines along which standards are practicable are discussed in article. Translated from Revue Electrique.

See also High-Tension.

Quick-Break Lever. Quick-Break Lever Switches (Moment-Hebelschalter), Fritz Dressler. Elektrotechnischer Anzeiger, vol. 36, no. 38, Aug. 21, 1919, pp. 409-410, 3 figs. Account of specifications of the V. D. E. for construction and examination of switch apparatus for tensions up to 750 volts, inclusive. Details and illustrations of recently patented lever switches.

Remote-Control. Remote-Control Sectionalizing Switch, H. P. Bell. Elec. Ry. Jl., vol. 55, no. 12, Mar. 20, 1920, pp. 565-566, 1 fig. Automatic sectionalizing Switch with GE-DB-276 contactor remodeled to take care of special

conditions encountered in substation of San Francisco-Oakland Terminal Railway.

[See also CIRCUIT BREAKERS; SWITCHBOARDS.]

ELECTRIC SYMBOLS

Electrical Machinery. See ELECTRICAL MACHINERY, Symbols for.

Standardization. Standard Graphic Symbols, Edward J. Cheney. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 95-97, 3 figs. Report of sub-committee of Standards Committee of Institute. General principles which should govern selection of standard symbols are discussed, and a list of suggested symbols covering most important items is offered for criticism in order to assist toward definite standardization.

ELECTRIC TRACTION

See RAILLESS TRACTION, Electric.

ELECTRIC TRANSMISSION

Farm Service. Managing Electric Service for Farmers, A. W. Jones. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 283-284. Experience of Peterson, Iowa, Power & Milling Co. during six years of business management of rural customers. Solutions of common contractual and engineering problems are suggested.

High-Voltage. The Limitations of High-Voltage Transmission, T. A. Worcester. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 880-884. Visualizes use of 220,000 volts as next step in transmission of energy. This is concluded from examination of past developments, which have involved a systematic increase in maximum voltage from 11,400 in 1894 to 150,000 in 1912. Difficulties to be met in installing transmission system at 220,000 volts and ways in which they may be solved are discussed.

Long-Distance, Power Required. The Power Required for Long Distance Transmission. Radio Rev., vol. 1, no. 12, Sept. 1920, pp. 598-608, 8 figs. Formulæ and graphs. Distances considered are 1000, 2000, 3000, 5000 and 10,000 km.

Systems. Systems of Electric Transmission, Alfred Still. Elec. Rev. (Chicago), vol. 77, no. 6, Aug. 7, 1920, pp. 193-198, 4 figs. Review of various systems with comment on present-day tendencies regarding voltages, tie lines, transmission of continuous currents, underground cables, interurban and rural lines.

[See also ELECTRIC DISTRIBUTION.]

ELECTRIC TRANSMISSION LINES

Accounting. Utility Construction Accounting. Elec. World, vol. 76, no. 12, Sept. 18, 1920, pp. 574-575, 1 fig. Urges using accounting system on construction of transmission and distribution lines and similar undertakings.

Alternating-Current. Theorems Relative to Transmission of Energy by Alternating-Current Analogous to Siemens Theorem Concerning Transmission by Direct Current. Critical Study (Théorèmes sur les transmissions d'énergie par courants alternatifs analogues à celui de Siemens sur les transmissions par courant continu; critique de ces théorèmes), André Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 17, April 26, 1920, pp. 978-983. Siemens theorem to which reference is made is: Power transmitted by direct-current electric line cannot exceed value determined by ratio of four times resistance of line to square of voltage, and corresponding efficiency is only 50 per cent. Analogous theorem is established for alternating-current transmission lines. Developed theorem is shown to be applicable to electric lines of any length, however great.

Buses. California 220-Kv. Transmission Bus. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 743-745. Proposal to interconnect high-tension systems of that state, of which a 220-kw., 1100-mile, 1,500,000-kw. line shall form backbone.

Calculation. Modern Methods of Designing and Operating High-Tension Electric Transmission Lines (Sur les méthodes modernes de calcul et sur le régime de fonctionnement des lignes de transmission d'énergie à haute tension), A. Blondel. Revue générale de l'Électricité, vol. 8, no. 6, Aug. 7, 1920, pp. 163-174, 8 figs. Graphs for simplifying calculations involving hyperbolic functions.

See also High-Tension.

Characteristics. Electrical Characteristics of Transmission Circuits, Wm. Nesbit. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 21-24. Consideration in regard to determination of frequency and voltage.

Construction Costs. Interconnecting Small Cities. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 321-324, 7 figs. Data on costs of present-day line construction, together with methods of emergency operation, collected from Indiana central-station companies serving 21 communities.

Construction Materials. How to Construct and Maintain the Overhead, Kirk J. Keith. Elec. Ry. Jl., vol. 56, no. 13, Sept. 25, 1920, pp. 587-588. Locating curves and frogs, methods of repair and special material designs are discussed. Paper read before Iowa Elec. Ry. Assn.

Corona. See CORONA.

Current Practice. Substations and Switchgear for Overhead Systems, Alfred Still. Elec. Rev. (Chicago), vol. 77, no. 10, Sept. 4, 1920, pp. 355-364, 11 figs. Present-day practice in operating and equipping transmission lines.

Design. Economical Design of a Transmission Line, Ryotaro Mitsuda. Dept. Communications, Tokyo, Japan, Researches Electrotechnical Laboratory, no. 79, Sept. 1919, 143 pp., 137 figs. on 68 supp. plates. Graphical solution of simultaneous equations obtained by putting to zero differential coefficients of total cost with regard to independent invariables.

Economic Voltage. Economic Voltage of Long Transmission Lines, Henry H. Plumb. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 4, April 1920, pp. 377-381, 8 figs. Paper indicates a solution of economic voltage for transmission lines by means of Kelvin's Law.

Economics of. Economic Study of Secondary Distribution, P. O. Reyneau and Howard P. Seelye. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 861-874, 13 figs. Problems taken up are (1) new lines in thinly populated districts where load will probably build up rapidly, (2) old lines in residence districts well built up where revision is necessary to care for slowly increasing load, (3) old lines in districts with heavy, increasing load such as business districts, and (4) exceptional installations such as for permanent loads with no increase or for a decreasing load. Equations and curves are derived and constructed and their application explained.

Electrical Characteristics. Calculation and Diagrams of the Electrical Characteristic of Long Distance Electric Transmission Lines (Calculs et diagrammes des lignes de transport de force à longue distance), M. L. Thielemans. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 20, May 17, 1920, pp. 1170-1173, 1 fig. Diagram combining the two formulæ for expressing relations between voltages and

ELECTRIC TRANSMISSION LINES

current intensities at both extremities of line.

Erection of. Planning, Designing and Erecting Transmission Lines, Alfred Still. Elec. Rev. (Chicago), vol. 77, no. 14, Oct. 2, 1920, pp. 509-513, 6 figs. Economic considerations in laying out line. Methods of erecting and anchoring steel towers, and of setting wood poles.

Feeder Voltage Regulation. Calculation of Feeder Voltage Regulation, W. C. Chappell. Elec. World, vol. 76, no. 2, July 10, 1920, pp. 73-74, 1 fig. Chart for computing voltage regulation of given feeder for any load and power factor.

Foundations. The Design of Transmission Line Foundations, G. D. Balsille. Commonwealth Engr., vol. 7, no. 9, April 1, 1920, pp. 259-263, 9 figs. Results of experiments carried out on transmission-line foundations.

Germany. Overhead Multiple-Suspension Line Construction of the Bergmann Electrical Works, Berlin (Fahrleitung mit Vielfachaurhängung für Vollbahnen der Bergmann-Elektricitäts-Werke A.-G., Berlin), H. Westphal. Elektrische Kraftbetriebe u. Bahnen, vol. 17, nos. 33 and 34, Nov. 24 and Dec. 4, 1919, pp. 257-261 and pp. 265-272, 21 figs. Description and illustrations of overhead system with multiple suspension, with a list of sections already completed and in operation and those under construction, totaling 256 km.

Grounded Neutral. Grounded Neutral, Robert Treat. Iron and Steel Elec. Engrs., vol. 2, no. 7, July 1920, pp. 19-35 and (discussion) 36-53, 5 figs. Discusses generators, transformers, cable systems, low voltage distribution, medium voltage distribution, transmission, auto transformers, methods of grounding, ground resistance, ground switch, alarm relay, meters, multiple grounds, grounding transformers, etc.

Half-Wave Lines. See Long-Distance.

Hardware for. Application of Mild and Alloy Steels to High-Tension Suspension Lines, L. R O'Neill. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 637-640. Discussion of application of stamped and pressed steel units of mild, structural and alloy steel of suspension problem in high-tension transmission. Factors to be considered in design of hardware for line construction.

High-Tension. An Extension of the Step-by-Step Method of Transmission Line Computation, Frederick Eugene Pernot. University of Cal. Publications in Engineering, vol. 2, no. 4, July 10, 1919, pp. 131-138. Carrying through analytical solution with receiving end voltage and current represented merely by symbols without assuming any values for them.

Arcing Grounds on High-Tension Lines, W. D. A. Peaslee. Elec. World, vol. 76, no. 9, Aug. 28, 1920, pp. 424-427, 6 figs. Experimental investigation of the voltage stress on insulators and connected apparatus on high-tension transmission lines due to normal-frequency voltage and the high-frequency surges caused by arcing grounds.

Calculation of Electric Transmission Lines by Means of Vectors Representing Real Quantities (Sur le calcul des lignes électriques par l'emploi de fonctions victorielles en notations réelles), André Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 11, Sept. 13, 1920, pp. 504-509. Suggests system of computing elements of high tension electric transmission lines without introducing imaginary quantities.

Cost of Building a 33,000-Volt Line. Elec. World, vol. 74, no. 15, Oct. 11, 1919, pp. 798-799, 4 figs. Steel-pole line 32 miles in length equipped with no. 1 copper wire is said to have been erected in Middle West at price of $3,181 per mile in 1918 when labor cost was particularly high.

Design and Operation of High-Tension Electric Transmission Lines (Sur les méthodes modernes de calcul et sur le régime de fonctionnement des lignes de transmission d'énergie à haute tension), A. Blondel. Revue générale de l'Électricité, vol. 8, nos. 5, 7 and 8, July 31, Aug. 14 and 21, 1920, pp. 131-141, 195-206 and 227-236, 16 figs. Technical and graphical study. Graphical method of computing characteristics. Suggested generalization of Brown diagram. Maximum power transmissible and maximum efficiency attainable.

Discussion of Code Rules on High-Potential Systems, G. S. Lawler. Elec. Rev. (Chicago), vol. 75, no. 20, Nov. 15, 1919, pp. 822-824. Comments on relation of present rules to developments in field practice, with suggestions for proposed changes in rules given in paper presented to National Assn. of Elec. Inspectors.

Excess Voltage Produced by Means of Sustained Oscillation (Sovratensioni elettriche prodotte dalle oscillazioni persistenti), L. Lombardi. Elettrotecnica, vol. 6, no. 26, Sept. 15, 1919, pp. 556-561. Laboratory experiments performed in high-tension artificial line.

Safety of High-Tension Transmission Lines (Beskyttelsesforanstaltninger ved Höispaendingsledninger), V. Faaborg-Andersen. Ingeniören, vol. 29, no. 45, June 5, 1920, pp. 347-348, 3 figs. Tests carried out in Denmark to ascertain type of safety appliance required to prevent electrocution by falling ends of an overhead electric conductor which accidentally breaks.

The 150,000-Volt Transmission Line of the Knoxville Power Company, Theodore Varney. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 563-670, 13 figs. Conductor is 500,000-cir. mil steel-reinforced aluminum cable.

Induction Coefficients. Induction Coefficients of Electric Transmission Lines (Coefficients d'induction des lignes électriques), P. Capdeville. Revue générale de l'Électricité, vol. 8, no. 5, July 31, 1920, pp. 152-156, 6 figs. Process for computing coefficients by introducing return conductor necessary to consideration of flux, but limiting its position in finite space.

Insulators. See INSULATORS, Line Tests for.

Interconnection. National Distribution of Electric Energy (Une distribution nationale d'énergie électrique), F. Scoumanne. Revue générale de l'Electricité, vol. 6, no. 19 and 20, Nov. 8 and 15, 1919, pp. 638-643, and 667-675. Study of economy resulting from interconnection of central stations. Suggested method of organizing progressive development of general distribution of energy. Question is considered in general without reference to any nation in particular.

Power and Transmission, H. H. Dewey. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 876-880. Writer calls attention to fact that while demand for power increased enormously during war, normal supply of generating equipment to meet that need was not immediately forthcoming. To supply this deficiency, tendency already in evidence toward inter-connection of power systems was greatly enhanced. He concludes that coöperation between manufacturers of electrical apparatus and operators who use them is essential to avoid serious difficulties of handling of future power networks.

The Seattle-Spokane Transmission Line, G. E. Quinan. Stone & Webster Jl., vol. 25, no. 5, Nov. 1919, pp. 350-357, 10 figs. on 4 supp. plates. Interconnection in one electrical system of various generating plants having total capacity of 298,100 hp.

Locating. The Engineer and the Right-of-Way, Charles Rufus Harte. Elec. Ry. Jl., vol. 55, no. 26, June 26, 1920, pp. 1301-1304, 3 figs. Plea for utilization of training of engineer in keeping down costs.

Long-Distance. "Half-Wave" Electric Transmission Lines (Sur les lignes de transport d'énergie demi onde), M. E. Brylinski. Bulletin de la Société française des Électriciens, vol. 10, no. 89, May 1920, pp. 169-185. Comparative value of "half-wave" and "quarter-wave" lines for transmission of electric power at great distances.

Long-Distance Electric Transmission Lines (Sur les lignes de transmission à longue distance), P. Bunet. Revue générale de l'Électricité, vol. 7, nos. 12, 21 and 23, Mar. 20, May 22 and June 5, 1920, pp. 395-403, 700-707 and 769-778, 2 figs. Mar. 20: Quarter-wave transmission for distance exceeding 600 miles in case of 50 periods per sec. Quarter-wave transmission can be economically used for direct transmission between two points when no energy is utilized at intermediary points. May 22: Characteristics of half-wave lines. June 5: It is explained how properties of semi-wave lines may be imparted to lines about 500 km. long by addition of self-induction or capacity.

Transmission of Electrical Energy at Great Distances (Sur le transport de l'énergie électrique à grande distance), M. E. Brylinski. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 16, April 19, 1920, pp. 927-930. Equations of quarter-wave line.

Losses in. Determining Losses in Transmission Lines, Oscar Gaarden. Elec. World, vol. 75, no. 10, Mar. 6, 1920, pp. 536-539, 4 figs. Tables are given showing kilowatt-miles for 80 per cent power factor and 10 per cent power loss and kilowatt-miles for 80 per cent power factor and 10 per cent voltage loss.

110,000-Volt. Transportation of Electrical Energy at 110,000 Volts between Gösgen, Switzerland, and Pouxeux, Vosges, France (Transport d'énergie électrique a 110,000 volts entre Gösgen (Suisse) et Pouxeux (Vosges), P. Caufourier). Génie Civil, vol. 77, no. 4, July 24, 1920, pp. 65-69, 13 figs. Total length of line is 115 miles. Power transmitted is 15,000 kw.

1100-Mile Line, California. Proposed Transmission Line for California, R. W. Sorenson, H. H. Cox and G. E. Armstrong. Eng. World, vol. 16, no. 3, Feb 1, 1920, pp. 127-130, 4 figs. Salient features of 220-kilovolt line to transmit 1,500,000 kw. 1100 miles.

Overhead Cable Crossings. The Overhead Cable Crossing, J. F. Springer. Sci. Am., vol. 122, no. 22, May 29, 1920, p. 594 & p. 606, 4 figs. Span of 50,000-volt long-distance power-transmission line at Three Rivers, Quebec. Each tower is 350 ft. high and 60 ft. square at base. Span is 4801 ft. long.

Performance. Electric Characteristics of Transmission Circuits, Wm. Nesbit. Elec. Jl., vol. 17, nos. 3, 6 and 7, March, June and July 1920, pp. 104-118, 257-263 and 299-311, 27 figs. March: Graphical method is presented for determining performance of long transmission lines. June: Study of performance of long transmission lines by means of hyperbolic trigonometric functions. July: Solution by hyperbolic functions, accompanied by tables and charts.

Protection. Automatic Protecting Apparatus for Alternating Current Net Works (Appareillage automatique de protection pour les reseaux à courants alternatifs), M. Rosebourne. Revue générale de l'Electricité, vol. 6, no. 22, Nov. 29, 1919, pp. 774-780, 14 figs. Comparative value of apparatus employed.

Automatic Protective Devices for Alternating-Current Systems, A. E. McColl. Jl. Instn. Elec. Engrs., vol. 58, no. 293, July 1920, pp. 525-543 and (discussion) pp. 543-554, 40 figs. Survey of recent developments.

Current-Balance Relay Protection, E. R. Stauffacher. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 465-467, 3 figs. Necessity for development of new system of relay protection where duplicate parallel lines are operated is met by current-balance relay.

Protection of Transmission Systems, Emil Aim. Elec. World, vol. 76, nos. 6 and 8, Aug. 7 and 21, pp. 277-278 and 377-380, 5 figs. Analysis of abnormal voltages on transmission systems and methods adopted by company in Sweden to protect station apparatus from insulation breakdown.

Switching and Protection of Transmission Circuits, S. Q. Hayes. Elec. Jl., vol. 17, no. 6, June 1920, pp. 263-271, 22 figs. Disconnecting switches and lightning arresters of electrolytic and horn-gap types.

Quarter-Wave Lines. See Long-Distance.

Reactance Calculation. Chart for Calculating the Reactance of a Conductor in an Electric Transmission Line (Abaque pour le calcul de la réactance d'un fil de ligne), Pantoja Leite. Revue générale de l'Électricité, vol. 7, no. 13, March 27, 1920, pp. 419-421, 2 figs. Chart permits calculation of any one of four quantities—reactance, frequency, distance between wires and diameter—in terms of the other three. It was constructed by means of a trigonometric transformation of formula giving reactance of single-phase or three-phase symmetric line.

Graph for Computing Reactance of an Electric Line (Abaque pour le calcul de la réactance des lignes électriques), R. Valensi. Revue générale de l'Electricité, vol. 8, no. 10, Sept. 4, 1920, pp. 313-314, 1 fig. Linear diagram constructed from general formula. Frequency of 50 is assumed.

Reconstruction. Transmission-Line Reconstruction, P. O. Reyneau and H. P. Seelye. Elec. World, vol. 74, no. 22, Dec. 27, 1919, pp. 1152-1153 and vol. 75, no. 1, Jan. 3, 1920, pp. 7-9, 1 fig. Methods and economic principles involved in analyzing cost of improvements, rebuilding, replacement and other similar problems on transmission lines.

Relays. See RELAYS.

Sag. Sags of Overhead Lines (Durchhänge von Freileitungen), Walther Grothe. Elektrotechnische Zeitschrift, vol. 41, no. 16, Apr. 22, 1920, pp. 311-313, 1 fig. Points out that most methods of calculation now in use are not suitable for daily practice, and seeks to develop a simple method which eliminates calculation errors as far as possible.

The Sag of Overhead Lines (Ueber den Durchhang von Freileitungen), Oskar Szilas. Elektrotechnische Zeitschrift, vol. 40, nos. 39 and 40, Sept. 25 and Oct. 2, 1919, pp. 477-479 and 493-497, 11 figs. Includes formulæ and charts which, the writer claims, prove that with very large sags and spans the average sag fluctuations caused by temperature changes are not very greatly influenced by span. Curves and tables of critical spans, temperatures and sags.

See also Stresses; Tension and Sag.

Short-Circuits. Short-Circuit Currents in Networks, W. R. Woodward. Elec. World, vol. 75, no. 13, Mar. 27, 1920, pp. 715-718, 8 figs. It is indicated how miniature network may be readily set up by means of flexible switchboard. Examples are worked out illustrating method of determining short-circuit current in network from calculating board.

Sinusoidal Currents in. Propagation of Sinusoidal Currents on Non-Uniform Lines (Propagation des courants sinusoïdaux sur des lignes quelconques), C. Ravut. Revue générale de l'Électricité, vol. 7, no. 19, May 8, 1920, pp. 611-615. By non-uniform lines are meant those in which resistance, self-induction, loss and capac-

ity per unit of length do not remain constant in the whole length of the line. Equations of propagation in such lines are studied.

Snow Loads. See ELECTRIC CONDUCTORS, Snow Loads on.

Steel Towers. New Type of Steel Tower, H. M. Bamford. Commonwealth Engr., vol. 7, no. 7, Feb. 2, 1920, pp. 201-203, 2 figs. Kay tower designed in England for electric power transmission is a four-sided structure and consists of struts of Mannesmann weldless steel tubes and ties of steel wire ropes braced together.

Steel Transmission Line Towers, E. F. Gemmill. Elec. Rev. (Chicago), vol. 76, nos. 10, 14, 16, 18 and 23, Mar. 6, Apr. 3 and 17, May 1 and June 5, 1920, pp. 385-390, 555-560, 645-651, 719-723 and 943-947, 25 figs. No. 10: Loading and wind pressure on transmission towers and lines. No. 14: Theory of catenary with supports at different elevations. No. 16: Reactions for towers located on steep grades; stringing wires on grades. No. 18: Relations between stress, temperature and sag in transmission lines; stresses of angle towers. No. 23: Selection of towers for different sections of a transmission line; methods of spacing, anchoring, assembling and erection of towers.

Steel Transmission Line Towers, E. F. Gemmill. Eng. World, vol. 16, no. 6, April 1920, pp. 305-310, 3 figs. Review of engineering practice in connection with loading and wind pressure on transmission towers and lines.

Steel Wire for. Economic Use of Galvanized Steel Wire, J. P. Jollyman and J. F. Strachan. Jl. Electricity, vol. 44, no. 8, Apr. 15, 1920, pp. 356-358, 6 figs. Curves showing comparative values of steel and copper wire for electric transmission lines. It is stated that galvanized steel is more useful for carrying light loads in high voltage distribution system. Paper read before Nat. Elec. Light Assn. Convention.

Stresses in. Alignment Charts for Determination of Tension and Sag of an Overhead Line for Any Length of Span Under Variable Temperature and Variable Load (Kolineare Rechentafeln (Nomogramme) zur Ermittlung von Spannung und Durchhang einer Freileitung bei veränderlicher Temperatur und veränderlichem Gewicht für beliebige Spannweiten), E. Seefehlner. Elektrotechnik und Maschinenbau, vol. 37, no. 52, Dec. 28, 1919, pp. 597-604, 6 figs. A calculating chart for third-degree equation for overhead lines is worked out which is said to permit determination of working conditions by linear methods.

Elastic Equilibrium of an Aerial Line of an Indefinite Number of Spans When One Span Fails (Sur l'équilibre élastique d'une ligne aérienne formée d'un nombre indéfini de travées identiques, quand les fils d'une travée sont rompus), E. Baticle. Revue générale de l'Électricité, vol. 8, no. 4, July 24, 1920, pp. 100-102. It is assumed that the number of supports on either side of failing span is large enough to permit normal tensions to exist at certain distances from failure. Equations are derived and applied to numerical case.

Supporting Structures. Supporting Structures for Transmission Lines, Alfred Still. Elec. Rev. (Chicago), vol. 77, no. 12, Sept. 18, 1920, pp. 443-447, 9 figs. Design of steel poles and towers.

Switzerland-France. Transmission of Hydroelectric Energy from Switzerland into France (Transport d'énergie hydro-électrique de Suisse en France), Paul Meyer. Révue générale de l'Électricité, vol. 7, no. 18, May 1, 1920, pp. 589-599, 18 figs. Line was designed to transmit 20,000 hp. a distance of 185 km. at 110,000 volts. Service is being provisionally rendered at 70,000 volts.

Tension and Sag. Charts Show Tension and Sag for Transmission Lines. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 529-530, 3 figs. Charts for finding proper sag and tension when given a line to string, so that allowable stress will not be exceeded in cold or windy weather, and also to determine what sag will correspond to any given tension under present conditions.

Three-Phase. The Electrical Properties of Three-Phase Transmission Lines, E. Parry. English Elec. Jl., vol. 1, no. 2, April 1920, pp. 54-68, 4 figs. Compilation of tables and data for use of departmental offices in designing transmission lines.

Towers. See Steel Towers.

Voltage Limitations. Electrical Characteristics of Transmission Circuit, Wm. Nesbit. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 485-489. Table showing approximate voltage limitation resulting from corona based on F. W. Peek's formulæ.

[See also CORONA, Loss Tests; ELECTRIC CIRCUITS; ELECTRIC CONDUCTORS; INSULATION; LIGHTNING ARRESTERS; POLES.]

ELECTRIC UNITS

Data on. Electric Units and Standards. Circular of Bur. of Standards, no. 60, Mar. 12, 1920, 68 pp. Notes on systems of units, including units in general, electrostatic and electromagnetic systems, and international electric units; evolution of present system of concrete standards; units and standards of principal electric quantities—resistance, current, electromotive force, quantity of electricity, capacity, inductance, power and energy, and resistivity; magnetic units. Appendices on conversion factors, legislation on electric units giving laws of various countries, and bibliography.

ELECTRIC WELDING

Applications. Electric Welding in Machinery, Ship and Railroad Construction (Das elektrische Schweissen als neues Arbeitsverfahren im Maschinen-Schiffs, und Eisenbahnbau), Ernst Schwarz. Elektrotechnik und Maschinenbau, vol. 37, no. 35 and 36, Aug. 31 and Sept. 7, 1919, pp. 389-394 and 404-410, 4 figs. Writer goes into details of electric welding, calls attention to its widespread employment in America and England, and discusses application of this method of welding to Austrian conditions.

Arc. See ELECTRIC WELDING, ARC.

Automatic Machines for. Greater Possibilities in Automatic Electric Welding Machines, H. L. Unland. Automotive Manufacturer, vol. 62, no. 4, July 1920, pp. 7-9 and 35, 7 figs. New device makes welding more than a repair or patching process and opens up chances for this process to qualify as important manufacturing auxiliary.

Cast Iron. Useful Hints on Electric Welding, H. L. Unland. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 863-865, 2 figs. Concerning selection of equipment and special precautions to take for welding cast iron. Writer emphasizes that in all cases care must be used in cleaning brake before welding.

D. C. vs. A. C. Direct and Alternating Current Welding, A. M. Candy. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 550-552, 4 figs. Comparative study of a. c. and d. c. electric arc welding. Paper read before Am. Iron & Steel Elec. Engrs.

Drop Forgings. Fusion Welding Applied to Drop Forgings, S. W. Miller. Welding Engr., vol. 4, no. 11, Nov. 1919, pp. 36-38 and pp. 54-56, 3 figs. Oxy-acetylene and electric welds and their applicability to defective forgings. Effect of high temperatures on physical structure. Paper presented before Am. Drop Forge Assn.

Electro-Percussive. Electro-Percussive Welding, Ethan Viall. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 881-882, 4 figs. Its possible uses for various processes in jewelry and similar manufacturing.

Evolution. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 497-499, 9 figs. Evolution of electric arc and resistance welding.

Improvised Equipment. How to Make an Electric Welding Outfit from Old Railway Motors, F. J. Foote. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 770-771, 1 fig. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 770-771, 1 fig. Field of 75-hp. motor was rewound with no. 8 B. & S. D. C. C. magnet wire taken from discarded machine. Motor was then coupled directly to Lorraine motor used as generator. Arrangement was tried at shops of Ohio Elec. Ry. and is said to have given capacity of 350 amperes at 150 volts.

Machines. Electric Welding Machines—Alternating Current Equipment, L. W. Webb. Power, vol. 52, no. 13, Sept. 28, 1920, pp. 501-503, 6 figs. Welding from alternating-current circuits with either resistance or reactance is first discussed, and then three special types of welding transformers are considered.

Electric Welding Machines—Direct-Current Constant-Potential Types, L. W. Webb. Power, vol. 52, no. 6, Aug. 10, 1920, pp. 210-212, 4 figs. Discusses voltages and efficiency of welding circuits. To hold the arc reactance is said to be necessary in welding circuit; machine can supply 40 to 50 per cent more circuits than its normal current rating. Describes operation of different makes of welding machines of the constant-potential type.

Electric Welding Machines—Factors Influencing Their Operation, L. W. Webb. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 337-338, 2 figs. Curves showing amount of reactance required in welding circuit for different values of current.

Progress. Electric Welding (Le soudage électrique), D. Lagrange. Société Belge des Électriciens, vol. 34, April-June 1920, pp. 86-95. Survey of progress throughout the world.

Railway Shop Equipment. Electric Welding, H. A. Currie. Off. Proc. New York RR. Club, vol. 29, no. 10, Nov. 21, 1919, pp. 5785-5791. Description of equipment used and work done in motor power shops of New York Central railway.

Rates for. Making Proper Rates for Electric Welding, S. T. Oesstreicher. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 70-72, 2 figs. Points out that question of central station rates is of vast importance to welding industry and advises that all factors be considered fairly and far-reaching coöperative policy be adopted.

Resistance. See ELECTRIC WELDING, RESISTANCE.

Safety Practice. See THERMIT WELDING, Safety Practice.

Ship Construction. Electric Welding and Its Application to Shipbuilding. Engineer, vol. 128, nos. 3331 and 3332, Oct. 31 and Nov. 7, 1919, pp. 442-444 and 472-473, 12 figs. Results of various tests of welded joints. Review of application of electric welding, with discussion of advantages to be secured by building a vessel in this manner. Translation of paper read before Swedish Soc. of Tech.

Electric Welding as Applied to Ship Building, Comfort A. Adams. Jl. Western Soc. Engrs., vol. 24, no. 3, March 1919, pp. 119-127 and (discussions) pp. 127-131. Suggestions in regard to selection of electrodes. Relative advantages of spot welding and arc welding.

Systems. Electric Welding (La soudure électrothermique), M. Bousquet. Revue d'Électrochemie et d'Électrometallurgie, vol. 13, no. 4, July and Aug. 1919, pp. 97-102. Three processes are explained: Lagrange-Hobo (electrolytic), Thomson (incandescent), and Barnardos (arc).

Systems of Electric Welding, J. F. Springer. Ry. & Locomotive Eng., vol. 32, no. 10, Oct. 1919, pp. 316-317, 4 figs. Troubles encountered and manner of overcoming them.

[See also FUSION WELDING.]

ELECTRIC WELDING, ARC

Alternating-Current. Electric Arc Welding with Alternating Current, Fred R. Daniels. Machy. (N. Y.), vol. 26, no. 10, June 1920, pp. 967-971, 9 figs. Advantages obtained by use of alternating current in welding and cutting of metal, and brief description of transformer-set welding equipment.

Apparatus for. Automatic Arc Welding Apparatus, S. R. Bergman and R. L. Unland. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 536-537. Dynamo with drooping volt-ampere characteristic obtained by use of constant-potential generators with resistance in series with arc.

Use and Abuse of Arc Welding Apparatus, H. L. Unland. Automotive Manufacturer, vol. 61, no. 11, Feb. 1920, pp. 27-29, 3 figs. Suitability of various processes for different kinds of work is pointed out.

Applications. Applications of Electric Arc Welding, C. B. Auel. Indus. Management, vol. 59, nos. 2 and 3, Feb. and March 1920, pp. 107-116 and 203-207, 28 figs. Feb.: Apparatus used is described and applications of welding to repairing of flywheels, locomotive frames, etc., are illustrated. March: Discusses relative merits of carbon and metallic electrode processes, and gives comparative costs of welding and data in regard to speed of making welds. Reference is also made to arc cutting.

Applications of Electric Arc Welding, Charles T. Perry. Textile World Jl., vol. 57, no. 19, May 8, 1920, pp. 107-109, 5 figs. Adaptability to textile-mill repair work is pointed out.

Arc Welding Apparatus and Its Applications, A. M. Candy. Welding Engr., vol. 5, nos. 1 and 2, Jan. and Feb. 1920, pp. 28-32 and 36, and 28-36, 44 figs. Jan.: Suggestions in regard to installation of equipment and selection of electrodes. Feb.: Advantages of wrapped electrodes are pointed out and records of welding shop costs are given.

Some Applications of Electric-Arc Welding. Metal Trades, vol. 11, no. 1, Jan. 1920, pp. 38-41, 9 figs. Illustrates filling blow-hole in steel casting by carbon-electro process, welding hatch-cover on steel vessel, repairing of brake fulcrum, and similar operations.

Carbon-Arc. Carbon-Electrode Arc Welding and Cutting, O. H. Eschholz. Elec. World, vol. 74, no. 22, Dec. 27, 1919, pp. 1158-1162, 9 figs. Enumerates advantageous applications of welding and cutting by means of carbon arc.

Carbon-Electrode. Carbon-Electrode Arc Welding and Cutting, O. H. Eschholz. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 499-504, 14 figs. Advantageous applications are enumerated.

Care of Equipment. The Use and Abuse of Arc Welding Equipment, H. L. Unland. Can. Machy., vol. 24, no. 4, July 22, 1920, pp. 99, 67. Precautions to be taken in use of electric arc welding equipment.

Cast Iron. Electric Welding of Cast Iron, J. F. Springer. Ry. and Locomotive Eng., vol. 33, no. 2, Feb. 1920, pp. 53-54, 1 fig. How cracked cast-iron front end of locomotive was welded

with U. S. L. arc welder without removing from locomotive.

Repairing Cast Iron Cylinders by Welding, H. G. Knox and James W. Owen. Int. Mar. Eng., vol. 25, no. 4, April 1920, pp. 340-347, 6 figs. How fractured large high-pressure marine engine cylinder was repaired by means of electric arc welding.

Restoring Cast Iron Cylinder by Electric Welding Process. Mar. News, vol. 6, no. 9, Feb. 1920, p. 97, 3 figs. Work involved operation of arc on working surface of cylinder and was done without removing cylinder from engine.

Welding Cast Iron With the Electric Arc, Otis Allen Kenyon. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 12-16, 17 figs. Typical illustrations of welding methods and suggestions in regard to overcoming brittleness and cracking.

Welding Cast Iron with the Electric Arc, Robert E. Kinkead. Welding Engr., vol. 5, no. 8, Aug. 1920, pp. 23-24. Comparative advantages of oxy-acetylene and electric processes for welding cast iron. Paper read before American Welding Society.

Welding the Interior Surface of a Cast Iron Cylinder, Otis Allen Kenyon. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 642-643, 4 figs. Description of job done on board a large ship by the Electric Welding Co. of America; repairs, it is explained, were made on second intermediate cylinder of quadruple-expansion engine, and damage consisted of number of deep scores and cracks.

Covering of Arc. New Electric Welding Box, J. Snowden Bell. Ry. & Locomotive Eng., vol. 33, no. 1, Jan. 1920, p. 27, 2 figs. Case for covering arc while weld is being made.

Dynamotor. A New Arc-Welding Dynamotor. Coal Age, vol. 16, no. 19, Nov. 6, 1919, p. 751, 1 fig. Set is composed of dynamotor and current-control panel. Generator is flat-compound wound and maintains normal voltage of 35 on either no load or full load.

Electrodes. Arc Welding, F. A. Anderson. Jl. Electricity, vol. 43, no. 12, Dec. 15, 1919, pp. 558-559, 5 figs. Relation between electrodes and parent metal.

Effects of Chemical Composition of Electrodes on Welded Material. Ry. Rev., vol. 65, no. 23, Dec. 6, 1919, pp. 831-833, 11 figs. Results of tests lead writer to conclude that it is just as important to specify chemical composition of electrode used in arc welding as when ordering any other type of steel, as chemical compositions seem to affect physical properties in electrodes as well as other steel. Photomicrographs are presented.

Electrode Materials for Metallic Arc Welding, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 11, no. 2, Feb. 1920, pp. 57-62, 3 figs. It is emphasized that successful lasting welds can only be obtained by using proper electrodes and methods of application.

Selecting Metallic Electrodes for Arc Welding, F. V. McGinness. Welding Engr., vol. 5, no. 3, Mar. 1920, pp. 38-40. It is stated that most successful welds can be obtained by use of homogeneous metallic electrode, particularly low in carbon, sulphur, manganese and phosphorus, so treated as to minimize oxidation of metal during welding process.

Engine Cylinder. Welding an Engine Cylinder from the Inside, Otis Allen Kenyon. Int. Mar. Eng., vol. 25, no. 3, March 1920, pp. 188-190, 3 figs. How 25 patches were welded on interior of cylinder by electricity without distorting bore of cylinder.

Equipment. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 537-542, 12 figs. Arc-welding equipment.

Examples. Modern Welding and Cutting. Ethan Viall. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 719-727, 16 figs. Examples of arc welding jobs.

Factors in. Arc Welding, F. A. Anderson. Jl. Electricity, vol. 44, no. 2, Jan. 15, 1920, pp. 70-72, 5 figs. Discusses properties of various metals in their relation to welding, efficiency of welds, and various factors which contribute to successful work.

Floating Unit. Floating Electric Welder, R. Royal Roane. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 488-491, 7 figs. Dimensions: Length overall, 87 ft.; rake at ends, 7 ft.; depth including bottom planking, 8 ft.; load draught, 4 ft. 2 in. Electric welding unit is to consist of two 400-ampere constant-potential arc-welding General Electric sets.

Flues. Electric Arc Welding and Electric Safe-Ending of Flues. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 374-380, 16 figs. Construction details of metal and carbon electrode holders. Committee report of Assn. Ry. Elec. Engrs.

Generator for. A New Type of Arc Welding Generator, S. R. Bergman. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 442-446, 9 figs. Direct-current machine with dual magnetic circuits.

Inspection. Inspection of Metallic Electrode Arc Welds, O. S. Escholz. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 749-752, 7 figs. Noting special part method of placing deposited layers plays on internal strains.

Instructions. Instructions in Electric Arc Welding Beads. Welding Engr., vol. 5, no. 2, Feb. 1920, pp. 52-54, 4 figs. From handbook of Electric Arc Cutting & Welding Co., Newark, N. J.

Locomotive Boilers. Locomotive Boiler and Fire Box Arc Welding, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 10, no. 12, Dec. 1919, pp. 431-439, 33 figs. Illustrates practice followed at repair shops of Rock Island Lines.

Locomotive Repair Work. Electric Welding in Locomotive Repair Work, W. C. Williams. Ry. Engr., vol. 41, no. 485, June 1920, pp. 246-250, 8 figs. Discusses influence of electric welding on locomotive design and repairs in United States.

Machines. A Semi-Automatic Arc-Welding Machine, Harry D. Morton. Am. Mach., vol. 51, no. 18, Oct. 30, 1919, pp. 789-794, 11 figs. Discussion of paper on Welding Mild Steel, read before Am. Inst. of Min. and Metallurgical Engrs.

Arc Welding Machinery of the U. S. Light & Heat Corporation, W. A. Turbayne. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 535-536. Notes on single-circuit type of arc welding machinery.

Automatic Arc Welding Machine. Ry. Age, vol. 68, no. 11, Mar. 12, 1920, p. 787, 1 fig. Consists of pair of rollers driven by small d. c. motor which draw in and deliver to arc steady supply of wire maintaining automatically best working distance.

Automatic Electric Arc Welding Machine, H. L. Unland. Welding Engr., vol. 5, no. 7, July 1920, pp. 26-28 and 32, 14 figs. Also in Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 403-406, 8 figs. Automatic arc welder is a device for automatically feeding metallic electrode wire into welding arc at rate required to hold a constant arc length. Article describes investigation to determine controlling feeding of elec-

trode to electric arc in a metallic-electrode welding circuit.

Characteristics and Performance of Arc Welding Machinery, A. M. Candy. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 531-533, 5 figs. Discusses increased efficiency of constant-potential welding circuit and decreased size and cost of apparatus by changing generated circuit potential from 75 to 60 volts, and gives curves showing efficiency increase and also disadvantages attending any material decrease of circuit potential below 60 volts.

Electric Welding Machines—Direct-Current Constant-Potential Types, L. W. Webb. Power, vol. 52, nos. 6 and 7, Aug. 10 and 17, 1920, pp. 210-212 and 250-253, 13 figs. Aug. 10: Operation of different makes of welding machines of constant-potential type. Aug. 17: Wiring diagrams are given of various types of so-called constant-current welding machines, and operation of machines is explained. Comparisons are made of different methods of control.

Metal Deposition in. Metal Deposition in Arc Welding, Pts. I and II, O. H. Eschholz. Elec. World, vol. 75, no. 26, June 26, 1920, pp. 1473-1475, 5 figs. and vol. 76, no. 3, July 17, 1920, pp. 118-121, 11 figs. Mechanism of metal transfer from electrode to plate is explained by the aid of photography. Evidence indicates that 85 per cent of the metal is carried across arc in liquid form by molecular forces.

Percussive. Principle of Percussive Welding, Douglas F. Miner. Iron Trade Rev., vol. 67, no. 9, Aug. 26, 1920, pp. 591-593, 5 figs. Current is discharged at parts to be joined and melts them prior to their being forged together. Because of localized heat physical structure of parts remains unaltered. Paper read before Am. Welding Soc.

Plastic-Arc, Ship Work. Plastic-Arc Welding Applied to Ship Construction and Repair, J. O. Smith. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 47-48. Enumerates reasons for defective rivets and observes that as long as present practice for repairing leaky rivets is to weld defective spots question naturally arises why it would not be advisable to weld plates at first.

Plastic Arc-Welding on Ship Work, J. O. Smith. Am. Mach., vol. 52, no. 4, Jan. 22, 1920, pp. 189-190, 3 figs. It is stated that figures determined by experiments of Emergency Fleet Corporation's Electric Welding Committee show that by welding saving in rivets and overlap plates would amount in 9500-ton ship to 500 tons.

Procedure. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 15, Oct. 7, 1920, pp. 665-670, 9 figs. Arc welding procedure.

Protective Apparatus. Use and Misuse of Arc Welding Apparatus, H. L. Unland. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 756-757. Points out necessity of protecting operators' eyes, head and hands, and for screening apparatus to protect near-by workmen.

Quasi-Arc Process. Electric Welding (La soldadura eléctrica), Jose O. Maveroff. Boletin de la Asociación Argentina de Electro-Técnicos, vol. 5, no. 8, Aug. 1919, pp. 131-137, 2 figs. Outline of quasi-arc electric welding process.

Railroad Shops. Arc Welding in Steam Railroad Shops, B. C. Tracey. Welding Engr., vol. 5, no. 6, June 1920, pp. 23-27, 18 figs. Survey of practices of various railroad shops.

Rails. Metallic Arc Welding of Rail Bonds, W. P. Bovard. Elec. Traction, vol. 16, no. 3, Mar. 1920, pp. 173-174, 9 figs. Current requirements are stated and applications to railway track work are illustrated.

Railway Repair Shops. Arc Welding in Car Equipment Maintenance. Elec. Ry. Jl., vol. 55, no. 12, Mar. 20, 1920, pp. 574-577, 13 figs. Illustrates building up of worn armature shafts, repairing of broken motor shells, filling in of flat spots on wheels and welding of different steel castings used on cars.

Electric Arc Welding in Railroad Maintenance, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 11, no. 1, Jan. 1920, pp. 21-28, 38 figs. Illustrates repairing and recovery of locomotives, frame members, axles, couplers, knuckles, car bolsters, etc.

Sets. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 583-588, 14 figs. Describes various makes of arc welding sets.

Short Arc, Advantages of. The Groove and Arc in Arc Welding, J. F. Springer. Ry. & Locomotive Eng., vol. 33, no. 1, Jan. 1920, pp. 21-22, 2 figs. Advantages of short arc are indicated and preheating of cast-iron welds is advised.

Some First Principles of Arc Welding with Metal Electrodes, J. F. Springer. Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 373-374, 2 figs. Writer establishes that best safeguard against rupture or dislocation of jet is maintenance of short arc.

Speed of. Speed of Metal Arc Welding, Wm. Spraragen. Welding Engr., vol. 5, no. 6, June 1920, pp. 44-47, 14 figs. Data are said to show that an operator can deposit 1.8 lb. per hour, this rate being less for outside work such as that done on boats. Curves are given which show time, metal and current used with welds of different metals. Paper read before Am. Welding Soc.

Steel. Welding of Bessemer and Open Hearth Steel, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 10, no. 11, Nov. 1919, pp. 406-408, 3 figs. Study of effect of impurities and result of electric arc on various compositions.

Steel Mills. Electric Arc Cutting and Welding in the Steel Mill, C. J. Hoslag. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 27-28. Economic advantages. Paper read before Am. Welding Soc.

Strength of Joint. Notes on Electric Welding, Henry S. Rawdon and O. H. Eschholz. Mech. Engr., vol. 42, no. 10, Oct. 1920, pp. 567-574, 21 figs. Electric welding of steel. Data on strength of joint and properties of arc-fused metal. Papers read before Washington Section of Am. Soc. Mech. Engrs.

Structural Steel. Electric Arc Welding Applied to Structural Steel Framing. Am. Architect, vol. 117, no. 2319, June 2, 1920, pp. 707-711, 8 figs. Experimental and laboratory research work done by Elec. Welding Co. of America.

Erects Electrically Welded Steel Structure in New York, Robert V. Ficker. Iron Trade Rev., vol. 66, no. 18, Apr. 29, 1920, pp. 1270-1272, 8 figs. Tests made by city building departments before permission to build structure by electric arc welding was given to Electric Welding Co. of America.

Welding Structural Steel Work, H. B. Payne. Elec. World, vol. 75, no. 25, June 19, 1920, pp. 1421-1422, 6 figs. Results obtained through use of electric welding for building up structural framework for small building erected by Elec. Welding Co. of America. It is said that work, which would have cost $85 per truss for riveting, was done by welding at cost of $50 per truss.

Technique. Elements of Arc Welding, O. A. Kenyon. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 25-27. Welding technique. Paper read before Am. Soc. M. E. and Am. Welding Soc.

Theory. A Theory of Metallic Arc Welding, Ralph

G. Hudson. Jl. Am. Welding Soc., vol. 1, no. 1, Oct. 1919, pp. 6-10, 5 figs. Welding is said to be accomplished by metal that is expelled from electrode in form of metallic vapor and minute liquid particles that are shot across to plate opposite at rate of about 50 a second. Force that propels these particles is believed to be pressure that arises from some formation of vapors and gases under intense heat of arc.

ELECTRIC WELDING, RESISTANCE

Arc Welding vs. Electric Resistance Welding. Chas. H. Kicklighter. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 42-48, 15 figs. Comparative study of electric arc and resistance welding.

Boiler Tubes. Welding Boiler Tubes by the Electric Resistance Process. P. T. Van Bibber. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 653-657, 8 figs. Details of process are explained and its application at various shops is illustrated.

Butt-Welding. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 17, Oct. 21, 1920, pp. 768-777, 30 figs. Electric butt-welding machines and work.

Percussive. Developments in Electro-Percussive Welding. Iron Age, vol. 105, no. 17, Oct. 21, 1920, pp. 1040-1041, 6 figs. Quantity production of duplicate parts. Dissimilar metals joined and cutting tools attached to low grade shanks. Paper read before American Welding Society.

Electro-Percussive Welding, Ethan Viall. Am. Mach., vol. 51, no. 20, Nov. 13-20, 1919, pp. 881-882, 4 figs. Its possible uses for processes in jewelry or similar manufacturing are pointed out, although it is said they have not yet been extensively tried.

Riveting vs. Electric Resistance Welding, Chas. H. Kicklighter. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 42-48, 15 figs. Writer seeks to show how disadvantages of spot welding as compared to riveting—that welder is heavy and cumbersome—can be largely overcome by reducing to minimum the mechanical pressure and strength of current necessary to effect a weld and, therefore, a comparatively light and portable welder can be employed which can be swung from a crane and quickly adjusted to work at hand.

Spot. Electric and Oxy-Acetylene Welding at the Bethlehem Fore River Shipyard. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 65-67, 7 figs. Illustrates applications of spot welding to join elementary pieces, reclaiming of broken tools, manufacturing ventilation pipes, etc.

The A-1 Electric Spot Welders. Iron and Coal Trades Rev., vol. 100, no. 2707, Jan. 16, 1920, pp. 79-80, 5 figs. Standard type constructed by A-1 Manufacturing Co., which has welding capacities for mild steel from 1/64 in. up to ⅞-in. made-up thickness.

Spot and Fusion. Electric Spot and Fusion Welding, F. Keith D'Alton. Elec. News, vol. 28, nos. 23 and 24, Dec. 1 and 15, 1919, pp. 33-35 and 30-33, 17 figs. **Résumé of progress.** Illustration of various types of joints.

ELECTRIC WIRING

Power-House Control Circuits. Simplifying Power-Station Wiring for Control Circuits, Ferdinand M. Bechoff. Elec. World, vol. 75, no. 23, June 5, 1920, pp. 1310-1311, 1 fig. Recommends standardizing of conduit size and carrying out a definite color scheme in control cables to eliminate complications of remote control.

Small Electric Appliances. Connection of Small Electric Appliances to Power Lines (Der Anchluss von Kleinapparaten an Starkstromnetze mit besonderer Berücksichtigung des Problems der kleinsten Gefährdung). F. Paul Habicht. Bulletin Association Suisse des Electriciens, vol. 10, no. 10, Oct. 1919, pp. 311-312. Discussing dangers arising from movable apparatus with ungrounded current, with grounded neutral or with third conductor grounded.

Vector Diagrams for. Application of Vectors to Wiring Diagrams, Lewis A. Terven. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 60-63, 11 figs. Illustrates manner of working out relay and metering schemes by means of vector diagrams.

ELECTRICAL APPARATUS

Cost Reduction. Present Status of Electrical Apparatus. Elec. World, vol. 75, no. 22, May 29, 1920, pp. 1261-1264, 4 figs. Standardization of electrical apparatus is suggested as best means of bringing down high cost of equipment. Committee report presented at convention of Nat. Elec. Light Assn.

ELECTRICAL ENGINEERING

Bi-Symbolic Equations. Bi-Symbolic Equations and Their Employment in Electrotechnology (Bisymbolische Gleichungen und deren Verwendung in der Elektrotechnik), August Hund. Elektrotechnik u. Maschinenbau, vol. 38, no. 26, June 27, 1920, pp. 289-293, 3 figs. Writer refers to symbolic expression by Steinmetz and Kennelly and seeks to show that when both are properly applied, complicated problems relating to forced as well as free oscillations can be solved according to a method similar to algebraic process.

Research Problems. Research Problems in Electrical Engineering, Vladimar Karapetoff. Elec. Rev. (Chicago), vol. 76, no. 25, June 19, 1920, pp. 1025-1026. Classification of present-day considerations in connection with broader aspects of research in electrical field.

ELECTRICAL INDUSTRY

Austria-Hungary. The Austro-Hungarian Electrical Industry During the War (Die österreichisch-ungarische Elektroindustrie im Kriege), Emil Honigmann. Elektrotechnik und Maschinenbau, vol. 37, no. 27, July 6, 1919, pp. 295-301. Review of production and operation, with tabulated data for years 1913-1918. While it is impossible to prophesy what effect the revolution will have on enterprises, to the author the future of this industry seems brighter than that of any other, because of the urgent necessity of development of water power and electrification of railways. Report before Austrian Chamber of Commerce.

Developments in 1919. A Review of Developments in the Electrical Industry in 1919, Ainslie A. Gray. Elec. Rev., vol. 76, no. 1, Jan. 3, 1920, pp. 1-8. All elements of industry, except electric railways, are described as being busy and prosperous.

Electrical Engineering in 1919. Engineer, vol. 129, no. 3340, Jan. 2, 1920, pp. 8-10. It is conceded that progress in electrical industry "was by no means insignificant," but doubt is expressed that establishment of super-power stations in place of existing stations should prove "such an immense (pecuniary) advantage to the public."

Some Developments in the Electrical Industry During 1919, John Liston. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 4-56, 118 figs. Among prominent developments recorded are electric propulsion equipment installed on board marine ships, 265-ton gearless passenger locomotive built for Chicago, Milwaukee & St. Paul, 60-cycle, 500-kva. automatic hydroelectric generators, and direct current welding which delivers current directly to arc without

use of any form of ballast resistance or external regulating device.

Economic Outlook. The Economic Outlook in Industry, Henry I. Harriman. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 200-201. It is emphasized that increased production and better human relations must be combined to attain lasting success.

Germany. Standardization, Classification and Specialization in the German Electrical Industry (Normalisierung, Typisierung und Spezialisierung in der deutschen elektrotechnischen Industrie), Paul Meyer. Elektrotechnischer Anzeiger, vol. 36, nos. 96, 97 and 98, Sept. 9, 11 and 14, 1919, pp. 452-453, 456-457 and 460-462. Discussion of standardization of measurements and forms of separate parts; limitation of number of specifications; and specialization, or expedient distribution of work among factories whereby activity of each is confined to production best fitted to its operating means and capacity. Paper by H. Hissink before Society of German Electrotechnical Industry with above title and referring to Mr. Meyer's work, vol. 36, nos. 115, 116 and 120, Oct. 18, 21 and 28, 1919, pp. 544-546, 550-551 and 568-569.

Organization. The Organization of the Electrical Industry, G. H. Wordingham. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 468-470. Discussion of the status of the electrical engineer, the position of semi-qualified men, protection of material interests, popularization of electrical methods, and the proposed charter for the Instn. of Elec. Engrs.

ELECTRICAL MACHINERY

Accidents. Causes of Various Accidents Occurring to Electrical Machines (Sur l'origine de quelques accidents dans les machines électriques), C. W. Worral. Revue générale de l'Electricité, vol. 6, no. 21, Nov. 22, 1919, pp. 727-730. Such as those due to gathering of dust in important parts, chemical action taking place between insulating material and metal, etc.

Brushes, Carbon. Standardization of Pure and Metallized Carbon Brushes (Unification des balais en charbon ou graphite pur ou métallisé). Revue générale de l'Électricité, vol. 7, no. 12, March 20, 1920, pp. 391-394, 6 figs. Specifications adopted on Jan. 7, 1920, by Committee of Union of Electrical Syndicates. Brushes for traction motors are not included.

Carbon and Commutator Wear. Carbon and Commutator Wear, R. E. Hellmund. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 579-582, 7 figs. Account of tests performed by writer.

Cooling. Cooling Devices for Electric Machinery (Neuere Kühleinrichtungen für elektrische Maschinen). Elektrotechnischer Anzeiger, vol. 36, nos. 61 and 62, June 19 and 22, 1919, pp. 279-280 and 283-284, 11 figs. Description of types made by Brown, Boveri & Co., Siemens-Schuckert-Werke and Allegemeine Elektrizitats-Gesellschaft.

Cooling of Electric Machines of High Power (Refroidissement de machines électriques de grande puissance), P. Bunet. Revue générale de l'Électricité, vol. 8, no. 10, Sept. 4, 1920, pp. 314-320. Proposes cooling system in which suitable volatile liquids are carried over parts to be cooled, allowed to evaporate there and then removed and condensed, following methodical cycle. Scheme provides also for utilization of heat removed from electric machine.

Investigation of Water-Air Radiators for Cooling Generators and Motors, H. G. Reist and E. H. Freiburghouse. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 91-98, 10 figs. Review of investigation made to devise means to overcome necessity of installing customary large ventilating air ducts for cooling electrical apparatus in propelling machinery of ship by applying closed system of air ventilation with water-air radiators for removing heat from circulating system.

Design. General Theory of Vectorial Diagrams in Electricity (Essai d'une théorie générale des diagrammes vectoriels en électricité), Leon Otis-Chevalier. Revue générale de l'Électricité, vol. 7, nos. 10 and 11, March 7, and March 13, 1920, pp. 315-324, 2 figs. and pp. 347-357, 9 figs. Theory of imaginary quantities is applied to vectorial representation of variations of principal elements in electrical generators and motors. It is assumed that currents are perfectly sinusoidal and that magnetic circuits are unsaturated, and hysteresis and Foucault losses are disregarded. Application of equations to design of various types of generators and motors is exemplified.

Developments. Year's Achievements of Westinghouse Company. Elec. Rev. (Chicago), vol. 76, nos. 1 and 2, Jan. 3 and 10, 1920, pp. 28-32 and 65-66, 5 figs. Jan. 3: Developments in condensers, alternating-current generators, stokers and transformers; Jan. 10: Review of developments in switching, protective, railway and marine apparatus and in miscellaneous appliances.

Dipping and Baking Coils. An Almost Laborless Dipping and Baking Plant. Elec. Ry. Jl., vol. 55, no. 8, Feb. 21, 1920, pp. 386-387, 5 figs. Equipment of International Ry., Buffalo, for dipping and baking armatures and field coils.

Eddy Currents in Stator Windings. Eddy Currents in Stator Windings, H. W. Taylor. Jl. Instn. Elec. Engrs., vol. 58, no. 290, Apr. 1920, pp. 279-298 and (discussion) pp. 298-300, 23 figs. Formulæ are developed for calculating eddy currents losses in conductors, both at bottom in slot and higher than bottom, and in top conductors when subjected to external influence of currents out of phase with those they themselves carry; also losses in conductors consisting of a number of laminations connected solidly together at ends, and in coils in which insulated laminations are continued from turn to turn, as well as in conductors and coils in which insulated laminations successively occupy different positions in conductor.

Exciter Systems. Selection and Design of Exciter System. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 234-236, 1 fig. Discussion of four systems: (1) Central systems with separately driven exciters; (2) central systems with direct-connected exciters; (3) individual systems with direct-connected exciters; and (4) individual systems with separately driven exciters.

Field Coils. A Direct Method of Calculating Shunt Field Coils Having Two Gages of Wire, R. G. Jakeman. Elecn., vol. 83, no. 2166, Nov. 21, 1919, pp. 577-578, 1 fig. Formulæ expressing ratio between winding depths of two standard gages, both in case larger gage is wound first and when smaller gage is wound first.

Flux Dispersion, Calculation. Calculation of the Dispersion of Flux in Electrical Machines (Calcolo delle dispersioni di flusio nelle macchine elettriche), E. Morelli. L'Elettrotecnica, vol. 6, no. 35, Dec. 15, 1919, pp. 774-779, 7 figs. Comparative study of various formulæ.

Heating of. Work of International Electrotechnical Commission in Regard to Heating of Electric Machines (Les travaux de la commission électrotechnique internationale concernant l'échauffement des machines électriques). Revue générale de l'Electricité, vol. 7, no. 6, Feb. 7, 1920, pp. 192-198. List of permissible

limits of temperature for various parts of electric machinery.

Iron Losses. High-Frequency Iron Losses, Thos. Spooner. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 9, Sept. 1920, pp. 809-813, 9 figs. Data are presented giving iron losses for five-mil, 4 per cent silicon sheet for a range of frequencies from 5000 to 50,000 cycles per second. An approximate separation of hysteresis and eddy current losses is made showing result of skin effect on these losses. Test method is described which, if desired, could be used over a much wider range of frequencies than those indicated; source of high-frequency supply was a new type of arc oscillator. Probable accuracy of results and possible sources of error are discussed.

Leipzig Show. Electrical Exhibits at Leipzig Exposition (Die Elektrotechnik auf der Leipziger Messe), P. Max Grempe. Elektrotechnischer Anzeiger, vol. 36, no. 96, Sept. 16, 1919, pp. 465-467. Description of an electro-pneumatic welding machine; an automatic motor-driven cold-saw; new electric lighting and cooking devices, etc.

Magnetic Flux. A Direct Recording Method of Measuring Magnetic Flux Distribution, F. S. Dellenbaugh, Jr. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 583-587, 2 figs. Revolving search coil fitted with collecting device and operating at high and constant speed.

Magnetic Losses. Core and Incremental Losses in Rotating Machinery, Laurence H. A. Carr. Elecn., vol. 84, no. 2192, May 21, 1920, pp. 562-564, 3 figs. Writer discusses core and so-called "stray" losses observable at no load, and the alteration in these losses with load. It is pointed out that with standard direct-current and alternating-current machines the ratio of loss with stalloy to loss with lohys appears to be about 80 to 85 per cent, but with turbo-alternators it is reduced to about 70 per cent.

Manufacture. Manufacturing Dynamos and Motors. Eng. Production, vol. 1, no. 7, July 1920, pp. 263-266, 12 figs. Describes methods employed in works of Lancashire Dynamo & Motor Co., Ltd., Manchester, Eng.

No-Load Losses. A Method for Separating No-Load Losses in Electrical Machinery, Carl J. Fechheimer. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 162-164, 3 figs. Method proposed makes use of idle operation of machine as motor, voltage being varied and speed kept constant. After deducting armature I^2R losses from watts input remaining watts are plotted against voltage. Formula is derived based upon assumption that watts are equal to constant windage and friction loss plus core loss, which latter varies as constant power of voltage,

Pole-Face Leakage. A Theory of Pole-Face Leakage (Eine Theorie der Stirnstreuung), Ludwig Dreyfus. Elektrotechnische Zeitschrift, vol. 41, nos. 6 and 7, Feb. 5 and 12, 1920, pp. 106-111 and 128-132, 21 figs. Writer seeks to overcome difficulties which stand in way of the space determination of the pole-face stray field. A theory of leakage from a single pole face is developed and results compared with those of other authors. Calculation of reciprocal inductance between coil ends of the same and of different phases are given with aid of tables.

Progress During War. Progress in the Construction of Electric Machines During the War (Fortschritte im Elektromaschinenbau während des Kriegs), E. Rosenberg. Elektrotechnische Zeitschrift, vol. 41, no. 9, Feb. 26, 1920, pp. 165-166. Refers to construction of large turbo-generators and transformers, introduction of air filters manufactured without fabric, electric propulsion of ships, traction experiments with direct current of 5000 volts, development of mercury rectifiers for high and normal voltages, and electric welding, especially in shipbuilding.

Remote Control of. Recent Devices for Electric Transmission of Commands (Neuere Einrichtungen zur elektrischen Befehlsübermittlung), H. Wolf. Elektrotechnische Rundschau, vol. 36, nos. 33-34, 37-39 and 42-43, Aug. 20, Sept. 15 and Oct. 15, 1919, pp. 121-123, 137-139 and 153-156, 25 figs. Details and illustrations of devices recently patented to be used in connection with electric-drive motors for purpose of enabling giver of command at main station at any time to confirm correct transmission of his message and to correct any disturbances in motor.

Speed Regulation. New Devices for Maintaining Speed of Electric Machines Constant (Neuere Einrichtungen zum Konstanthalten der Drehzahl elektrischer Maschinen). Elektrotechnischer Anzeiger, vol. 36, nos. 144 and 145, Dec. 9 and 10, 1919, pp. 689-690 and 693-694, 11 figs. Details and illustrations of various devices recently patented.

Surface Temperatures, Measurement of. Study on the Measurement of Surface Temperatures in Connection with Electrical Engineering (Zur Frage der Messung von Oberflächentemperaturen in der Elektrotechnik), Max Jakob. Archiv. für Elektrotechnik, vol. 8, no. 4, Aug. 28, 1919, pp. 126-132, 3 figs. Its importance in electrical engineering and methods for measuring.

Symbols for. Schematic Representation of Electrical Machines, Transformers, Apparatus, Networks and Heavy-Current Installations (La représentation schématique électrique des machines, transformateurs, appareils, canalisations et installations de la catégorie dite à courant fort), A. Hayet. Revue générale de l'Électricité, vol. 7, no. 14, April 3, 1920, pp. 455-469, 24 figs. Symbols are suggested and rules are formulated for drawing out schemes of electrical installations.

Synchronous Machines. Importance of Short-Circuit Ratio in Synchronous Machines, Theo. Schou. Elec. Rev. (Chicago), vol. 76, no. 25, June 19, 1920, pp. 1015-1018, 9 figs. Explanation of graphic method for determining characteristics of synchronous machines either when operating as alternators or as motors. Typical curves obtained by use of such method.

Voltage Standardization. Standardization of Operating Voltages in Switzerland (Zur Frage der Vereinheitlichung der Betriebsspannungen in der Schweiz). Schweiz. Elektrotechnischer Verein Bul., vol. 11, nos. 4 and 5, Apr. and May 1920, pp. 79-89 and 113-115, 5 figs. Low-voltage standards (100 to 800 volt) as presented by the Swiss Electrotechnical Assn., who recommend that manufacturers of electric apparatus adopt them so that a rational and standard apparatus may be produced more cheaply.

Windings, Temperature Distribution in. Distribution of Temperature in Electric Winding of Rectangular Cross-Section (Die Temperaturverteidung in einer elektrischen Wicklung von rechteckigem Querschnitt), Max Jakob. Archiv. für Elektrotechnik, vol. 8, no. 4, Aug. 28, 1919, pp. 117-126, 6 figs. Graphs and tables showing distribution in various cross-sections.

ELECTRICAL MATERIALS

Standardization, France. French Rules of Standardization of Electrical Material (Règles françaises d'unification du matérial électrique). Jl. des Usines à Gaz, vol. 44, no. 9, May 5, 1920, pp. 129-135, 4 figs. Prepared by French Electrotechnical Committee. Regulations refer to insulators, armored cables, etc.

ELECTRICAL MEASUREMENTS

High Alternating Voltages. Notes on the Synchronous Commutator, J. B. Whitehead and T. Isshiki. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 105-116, 19 figs. Magnitude of errors which may arise due to relatively small amounts of capacity in commutator and galvanometer circuits is studied for number of different connections, and methods for eliminating them are pointed out.

Inductance and Capacity. A Universal Inductance and Capacity Testing Bridge, C. V. Drysdale. Elecn., vol. 84, nos. 2175 and 2176, Jan. 23 and 30, 1920, pp. 80-82, 12 figs., and 108-109, 9 figs. Consists of plain four-arm Wheatstone bridge, each arm being provided with four coils of 1, 10, 100 and 1000 ohms. Article describes manner of conducting tests and of measuring electrolytic resistance.

Potential Difference. See POTENTIAL DIFFERENCE, Measurement.

ELECTRICITY

Atmospheric, Utilization of. A New Source of Energy and Its Useful Possibilities (Eine neue Energiequelle und deren Verwendungsmöglichkeiten für die chemische Industrie), Hermann Plauson. Chemiker-Zeitung, vol. 44, no. 34-35, Mar. 23, 1920, pp. 229-231. Notes on recovery and utilization of atmospheric electricity, which, it is claimed, can be utilized in a practical manner and which offers the prospect of a working capacity of 200 hp. in form of electric energy for every sq. km. of soil. Some of its uses in chemical and electrochemical industries are pointed out.

Discharge in Gases. Experiments with Perforated Electrodes on the Nature of the Discharge in Gases at Low Pressures, F. W. Aston. Proc. Roy. Soc., vol. 96, no. A-676, Oct. 9, 1919, pp. 200-210, 4 figs. Direct measurements made with Faraday's cylinder behind cathode and at same potential are said to have indicated that about one-half of total current in discharge is brought up to cathode by positive ions.

Industrial Uses. The Use of Electricity in Industrial Works (Die Verwendung der Elektrizität in der Grossindustrie), M. Lintz. Schiffbau, vol. 21, nos. 25, 26, 30 and 32, May 12, 19, June 16 and 30, 1920, pp. 687-692, 713-717, 824-828 and 874-877, 32 figs. Details of speed indicator, time-recording apparatus, long-distance thermometer installation, temperature recorders, tension transformers, water jet apparatus for discharging static charge to costs (horn-type connectors for equalization of excess voltages of an oscillating nature for wireless sections or metal electrodes in given distance from one another), etc., of the Siemens & Halske Corp. and Siemens-Schuckert Works.

Inertia of. Inertia of Electricity (La Inercia de la Electricidad), Ricardo Gans. Contribución al estudio de las ciencias, fiscias y matemáticas, Universidad Nacional de la Plata, no. 38, Dec. 1918, pp. 225-230, 4 figs. Criticism of claims made by P. de Heen in Mémoirs de la Société Royale des Sciences de Liege, vol. 6, 1905, p. 24, where in article on matter, its origin, its evolution and its end he claims to have observed centrifugal forces developed by electric current flowing through spiral wire. Writer claims that forces observed by de Heen were well-known electromagnetic forces between mobile and fixed parts of circuits.

Modern Theories. The Modern Theories of Electricity (Les théories modernes de l'électricité), A. Boutaric. Industrie Électrique, vol. 28, no. 656, Oct. 25, 1919, pp. 395-398. Fundamental conceptions of electrons and the atomic theory.

Price Per Kw-Hr. Alignment Charts for the Graphical Computation of Rates of Electricity (Abaques à alignement pour le calcul graphique des tarifs d'électricité), R. Courau. Revue générale de l'Electricité, vol. 7, no. 24, June 12, 1920, pp. 801-807, 4 figs. Graphs constructed from formulæ for determining price of kw-hr.

Recovery from Atmosphere. See ATMOSPHERE, Electricity from.

Uses, Heat Units Utilized. See GAS, Uses, Heat Units Utilized.

Uses in War, German. Electricity in the War (Die Elektrizität im Felde), H. Buschmann. Elektrotechnischer Anzeiger, vol. 36, nos. 107 and 109, Oct. 5 and 8, 1919, pp. 507-508 and 517-518. Refers to important share of successful military operations of German army due to electrical applications. Gives details of various electrical devices which were used successfully during war.

Weyl's Theory. See GRAVITATION, Weyl's Theory.

ELECTRICITY, APPLICATIONS OF

Cooking. See ELECTRIC COOKING.

Domestic Uses. Domestic Uses of Electricity (L'électricité au foyer), W. Vaillancourt. Revue trimestrielle Canadienne, vol. 5, no. 19, Nov. 1919, pp. 293-310. Comparative costs of heating, washing, etc., by electricity and coal. Figures in Canada, United States and Norway are given.

Foreign Countries. Domestic Electric Service Among the People of Foreign Countries. Elec. World, vol. 75, no. 9, Feb. 28, 1920, pp. 484-485. Survey of conditions in Russia, Japan, United Kingdom, France, Italy and other countries, indicating possibilities for expansion in electrical industry.

Metallurgy. Use of Electricity in Metallurgical Processes, Robert M. Keeney. Elec. Jl., vol. 17, no. 5, May 1920, pp. 206-212. Recent applications of electricity in metallurgy are reviewed and opinion is expressed that further uses are to be expected in duplex process of cupola melting with electric-furnace refining, in process of manufacturing alloy steels, ferro-alloys, aluminum, brass and electrolytic zinc, and in electric smelting of non-ferrous ores.

Warfare. Electricity in the War Zone (Die Elektrizität im Felde), H. Buschmann. Elektrotechnischer Anzeiger, vol. 36, nos. 110, 115 and 116, Oct. 9, 18 and 21, pp. 521-522, 543-544 and 549. Notes on listening stations; electrically controlled machine guns on airplanes, operation of which was independent of circulation propeller whereby propeller was protected against its own machine gun; field telegraphy and telephony. Utilization of electricity as power source for motor-drive in flour mills, bakeries, slaughterhouses, etc. Electric drive in connection with funicular railways for transportation of passengers, foodstuffs, munitions, etc.; use of electrically driven machines and ventilators in plants for expert treatment of skins and recovery of technical fats from carcasses of horses.

ELECTRICITY SUPPLY

British Law. The Electricity (Supply) Act, 1919. Elec. Times, vol. 57, no. 1472, Jan. 1, 1920, pp. 8-10. Synopsis of British Act.

Farms. Salient Facts Concerning Service to Farming Communities, H. W. Young. Elec. Rev. (Chicago), vol. 76, no. 1, Jan. 3, 1920, pp. 35-36, 1 fig. Methods of obtaining farming load. Comparative costs of utility and isolated plant service and unit of cost on kilowatt-hour basis are given.

Future of. Present Position and Future of Electricity Supply, S. J. Watson. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 470-472. Writer states that in connection with future progress,

say, for twenty years, there are four important potential demands to take into consideration, (1) industrial power, (2) railways and transport, (3) chemical and electro-metallurgy and (4) domestic supplies; and he summarizes annual output in addition to present supply, which electricity supply industry may be called upon to deal with at end of twenty years.

Government Regulation. Trend of Regulation, Carl D. Jackson. Nat. Elec. Light Assn. Bul., vol. 7, no. 5, June 1920, pp. 344-349. Writer maintains that development of large central plants for economic distribution of electrical energy is inconsistent with confinement of enterprise to boundaries of municipal or political units. He indorses proper use of curved line in figuring depreciation and depreciation reserve.

ELECTRIFICATION

Railway. See RAILWAY ELECTRIFICATION.

ELECTROCHEMICAL INDUSTRY

Development of. Development of Electrochemical Industry (Die Entwicklung der elektrochemischen Industrie), Hans Goldschmidt. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, nos. 37 and 38, Sept. 13 and 20, 1919, pp. 877-883 and 918-923. Discussed from economical and technical point of view.

ELECTROCHEMISTRY

See COLLOIDS; ELECTROLYTES; ELECTROLYTIC CELLS.

ELECTRODEPOSITION

Iron. See IRON, Electrodeposition.

ELECTRODES

Electric-Furnace. See ELECTRIC FURNACES, Electrodes.

Electric Welding. See ELECTRIC WELDING, ARC, Electrodes.

Hydrogen. A Simple Hydrogen Electrode, C. H. Bailey. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 45-48, 2 figs. Made by blowing small bulb in closed end of 7-mm. tube which is then bent at angle of about 30-deg. about 50-mm. below top of bulb and fitted at open end with solid glass stopper. Metal electrode is round piece of thin gold plate 5-mm. in diameter.

Polarized. Double Layers and Surface Tensions of Polarized Electrodes (Ueber Doppelschichten und Oberflächenspannung an polarisierten Elektroden), Karl F. Herzfeld. Physikalische Zeitschrift, vol. 21, nos. 2 and 3, Jan. 15 and Feb. 1, 1920, pp. 28-33 and 61-67, 1 fig. On assumption that only electric forces affect the ions and that the neutral molecules are not affected by any forces, calculation is made, based on Chapman formula, of formation of double layer brought about by the natural polarization and its influence on surface tension. It is shown that Lippmann-Helmholtz and Gibbs-Warburg equations are both correct and both give same results when besides mercurial salt another indifferent electrode of same value is added.

ELECTRODYNAMICS

Fundamentals. On the Fundamental Formulations of Electrodynamics, G. H. Livens. Phil. Trans. Roy. Soc. of London, Series A, Vol. 220, no. 7, pp. 207-245. Writer's object is the formulation of a complete and precise statement of the theory in the only form in which it is logically consistent, comparison of this form with current statements of the theory, and the exhibition in their true aspects of the various derived theories which are included in the general scheme.

ELECTROLYSIS

Alternating-Current. On Alternating Current Electrolysis, S. March. Proc. Roy. Soc., vol. 97, no. A682, Apr. 1, 1920, pp. 124-144, 10 figs. Behavior of platinum, gold and nickel electrodes during passage of alternating current through different electrolytes was examined. Small bubbles of gas were formed at electrodes. Their formation is attributed to oxidation of electrode, coupled with subsequent reduction by hydrogen at next half-period, and absorption and adsorption of hydrogen by electrode coupled with recombination with oxygen at next half period.

Concrete. See CONCRETE, Electrolysis.

Electric Railway Track. Calculation of Electrolytic Currents in Metallic Masses in the Neighborhood of an Electric Railway Track (Sur le calcul des courants d'électrolyse dans les masses métalliques voisines d'une voie de traction électrique), M. Girousse. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 22, May 31, 1920, pp. 1313-1315. General formula expressing electrical state of ground surrounding track is developed, and method is indicated for estimating currents flowing through near-by metallic masses.

Electric Waves, Influence of. The Influence of Electric Waves on Electrolysis (Einfluss elektrischer Wellen auf die Elektrolyse), Franz Grünwald. Elektrotechnischer Anzeiger, vol. 37, no. 36, Mar. 3, 1920, p. 170, 1 fig. It is stated that North German Refinery uses for gold refining, direct current with superimposed unsymmetrical alternating current of 50 periods per sec., according to Wohlwill process.

Hydrogen Overvoltage. Hydrogen Overvoltage, Applications of Its Variation with Pressure to Reduction, Metal Solution and Deposition, D. A. MacInnes and A. W. Contieri. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 2013-2019, 3 figs. Increase of hydrogen over voltage with a diminished pressure is shown to follow, in nearly quantitative manner, from theory advanced by MacInnes and Adler.

The Effect of an Alternating Current on Hydrogen Overvoltage. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 36, pp. 453-475, 12 figs. Lowering cathodic polarization of hydrogen by superposing alternating current on direct current was studied experimentally with platinum, lead, and copper cathodes. It was found that magnitude of depolarization is function primarily of ratio of alternating to direct current and is independent of electrodes and of current density, also that effect varies slightly with frequency, tendency being to increase as frequency is diminished.

Molar Conductivity. Limiting Values of Molar Conductivity and the Extrapolation Laws of Kohlrausch (Die Grenzwerte des molaren Leitvermögens und die Extrapolationsgesetze von Kohlrausch), Richard Lorenz. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 3, Oct. 1, 1919, pp. 191-210. It is concluded that the rules and table of Ostwald-Bredig, although approximately correct and adaptable for rapid calculations, cannot be depended upon for exact determinations, in which case the Kohlrausch method is preferable. Twelfth article of a series on the Theory of Electric Ions, from the Inst. for Physical Chem. of the University and Physical Soc., Frankfurt.

Nitration of Anodes. Behavior of the Hydronitrogens and Their Derivatives in Liquid Ammonia. VI. Electrolytic Nitration of Various Anodes in a Solution of Ammonium Trinitride, A. W. Browne, M. E. Holmes and J. S. King. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1769-1776. Results of experiments upon behavior of various metallic anodes. It is claimed that copper anodes undergo electrolytic

corrosion to extent indicating formation of corrosion trinitride, with cupric trinitride formed as main product.

Underground Pipes. Electrolysis in Metallic Masses in Neighborhood of Electric Car Line (Sur le calcul du courant lancé dans le sol par les rails des tramways electriques), M. Girousse. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 846-849. Estimation of intensity of current likely to produce electrolytic effect in terms of characteristics of track, resistivity of soil and metallic masses where electrolytic effect may take place.

Problems of Electrolysis, L. G. Bischoff. Telephone Engr., vol. 22, no. 6, Dec. 1919, pp. 25-31, 4 figs. Rising in connection with operation of electric railways.

Underground Structures. Some Aspects of Electrolysis, Gellert Alleman. Can. Engr., vol. 39, no. 4, July 22, 1920, pp. 175-177. Damage resulting from placing iron pipe and steel rail in moist sand, with difference of electrical pressure maintained between them, and some electrolyte, such as salt, present.

ELECTROLYTES

Activities of Ions. The Activities of the Ions in Aqueous Solutions of Some "Strong" Electrolytes, Frederick H. Getman. Jl. Am. Chem. Soc., vol. 42, no. 8, Aug. 1920, pp. 1556-1564, 1 fig. Experimental evidence is presented in confirmation of conclusions reached by several investigators, that conductance-viscosity ratio does not afford trustworthy measure of ions of strong electrolytes.

Coagulating Power. Coagulation of Metal Sulphide Hydrosols. Influence of Temperature on the Rate of Coagulation of Arsenious Sulphide Hydrosols, Jnanendra Nath Mukherjee. Jl. Chem. Soc., vol. 117 and 118, no. 690, April 1920, pp. 350-358. Experimental. It was found that rise in temperature has different effects on rate of coagulation, depending on nature of electrolyte, quality of sol and concentration of electrolyte.

Colloidal. Colloidal Electrolytes. Soap Solutions and Their Constitution, James W. McBain and C. S. Salmon. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 426-460, 3 figs. Also in Proc. Royal Soc., vol. 97, no. A681, Mar. 1, 1920, pp. 44-65, 3 figs. Theory of soap solutions is set up from which colloidal electrolytes are defined as "salts" in which one of the ions has been replaced by an ionic micelle.

Colloidal Electrolytes: Soap Solutions as a Type, James William McBain, Mary Evelyn Laing and Alan Francis Titley. Jl. Chem. Soc., vols. 115 and 116, no. 685, Nov. 1919, pp. 1279-1300, 3 figs. Theory of colloidal electrolytes is derived from conception that ions may be created to form nucleus of colloidal particle, termed ionic micelle, while retaining their equivalent electrical charges.

Conductivity. Studies in Conductivity. The Behavior of Mixtures of Two Salts Containing a Common Ion in Anhydrous Formic Acid Solution, H. I. Schlesinger and F. H. Reed. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1921-1934. Method of calculating from ionization constants degree of ionization of each of two salts containing common ion when two salts are both present in solution has been developed for case in which both salts obey mass law.

Studies in Conductivity. Transference Numbers of the Formates of Sodium, Potassium and Calcium in Anhydrous Formic Acid, H. I. Schlesinger and E. N. Bunting. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1934-1945. From data obtained experimentally for salts of sodium and potassium equivalents conductance of formate ion is calculated to be 51.5, whereas corresponding value for sodium ion is 14.6 and for potassium ion 17.5 reciprocal ohms. Significance of these data is discussed.

Conductivity and Concentration. The Variation of Electrical Conductivity of Electrolytes with Increase in Concentration, Alfred W. Porter. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 122-125, 2 figs. Discusses accuracy of van Hoff's equation.

Conductivity and Frequency Curves. Conductivity and Frequency, E. D. Eastman. Jl. Am. Chem. Soc., vol. 42, no. 8, Aug. 1920, pp. 1648-1655, 3 figs. It is suggested that conductivity of solutions of electrolytes should be smaller at zero frequency than at any frequency in a certain range immediately above zero. Measurements made to test this idea are described.

Conductivity Measurements. Industrial Applications of Electrolytic Conductivity Measurements, Earl A. Keeler. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 3, pp. 25-30, 2 figs. Use of accurate conductivity measurements on electrolytes to determine therefrom variations in their composition, such as using salt solution of known conductivity as solvent for sugar, and determining amount of sugar by its effect in increasing resistivity of solution.

Ion Transference Numbers. On the Correction of the Transference Numbers of the Ions of an Electrolyte, W. R. Bousfield. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 74-80, 2 figs. Theoretic investigation of relation of Hittorf number to true transference number.

Ionization. See IONIZATION.

Ionization Constant. A Thermodynamic Study of Electrolytic Solutions, Frank L. Hitchcock. Proc. Nat. Acad. of Sciences, vol. 6, no. 4, April 1920, pp. 186-197. Theoretical examinations of data obtained in regard to relationship between ionization constant and concentration.

Liquid-Junction Potentials. Reproducible Liquid Junction Potentials: The Flowing Junction, Arthur B. Lamb and Alfred T. Larson. Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 229-237, 3 figs. Details of experiments which are said to have led to development of type of junction, which, even under unfavorable conditions, that is, with ions of marked differences in mobility, gives electromotive forces reproducible to 0.01 of a millivolt.

Mixed, Ionic Activity in. The Activities of the Ions in Solutions of Mixed Electrolytes, Ming Chow. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 497-502, 1 fig. Measurements in millivolts of electromotive forces of cells at 25 deg. cent.

ELECTROLYTIC CELLS

Cylindrical. The Cylindrical Electrolytic Cell, L. D. Vorce. Chem. Age, vol. 28, no. 8, Aug. 1920, pp. 279-281, 2 figs. Comparison of cylindrical and box-shaped cells. Paper read before Am. Inst. Chem. Engrs.

Early Commercial Types. Early Commercial Electrolytic Cells, Charles B. Barton. Chem. & Metallurgical Eng., vol. 23, no. 5, Aug. 4, 1920, pp. 189-191. Reminiscences of pioneer chlorine-cell work done at Rumford Falls, Maine, and Berlin, New Hampshire. Graphite electrodes introduced. Porous diaphragm cell developed.

Resistance of. The Resistance of an Electrolytic Cell, E. Newberry. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 126-136. Experimental determination of that part of irreversible resistance of electrolytic cell which is concerned in transfer of current from electrode to electrolyte in various types of cells.

ELECTROLYTIC REFINING

Cathode Reactions. The Reactions of Cathodes in the Separation of Metals (Ueber Kathodenvorgänge bei der Metallabscheidung), H. Kohlschütter and E. Vuilleumier. Das Metall, year 1919, nos. 17 and 18, Sept. 10 and 25, 1919, pp. 231-233 and 245-246, 5 figs. It is demonstrated with aid of contractometer that metal layers undergo a contraction from the moment they appear, which increases regularly with further separation; from which it is concluded that two separate reactions follow one another; namely, the fixation of a skin on the cathode and its subsequent contraction. A plausible connection between nature of separation and separation potential are said to exist.

ELECTROMAGNETIC WAVES

Excitation Inside Sphere. Excitation of Electromagnetic Waves in the Interior of a Metallic Sphere (Un excitador de ondas electromagnéticas en el interior de una esfera metálica), Jose B. Collo. Contribución al estudio de las sciencias físicas y matemáticas, Universidad de la Plata, no. 38, Dec. 1918, pp. 303-330, 5 figs. Theoretical study based on application of Planck formulae.

Transmission About Earth. The Transmission of Electro-Magnetic Waves About the Earth, J. Erskine-Murray. Wireless World, vol. 7, no. 83, Feb. 1920, pp. 651-664, 15 figs. Survey of researches by different experimenters. Paper read before Wireless Soc. of Lond.

ELECTROMAGNETISM

Galvanomagnetic Effects. Analysis of Three Galvanomagnetic Effects. Confirmation of a New Effect (Analyse de trois effets galvanomagnétiques. Confirmation d'un nouvel effet), A. Sellerio. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1570-1573, 2 figs. Experimental study claimed to have confirmed that when a plate is traversed by an electric current perpendicular to a magnetic field, the field causes flow of current along lines of magnetic force.

Kinematic Interpretation. A Kinematical Interpretation of Electromagnetism, Leigh Page. Proc. Nat. Acad. of Sciences, vol. 6, no. 3, March 1920, pp. 115-122, 4 figs. Equations of electrodynamics are shown to be simple kinematical relations between moving elements which constitute lines of force. If sources of these moving elements are supposed to rotate, free magnetic charges are produced and four equations of electromagnetic field assume symmetrical form. Energy radiated due to rotation is found to amount almost exactly to 1/32 hv for each revolution.

Reaction, Principle of. Electromagnetism and the Principle of Reaction (L'électromagnétisme et le principe de réaction), G. Meller. Association des Ingénieurs Electriciens sortis de l'Institut Electrotechnique Montefiore, 1920, pp. 25-96, 16 figs. Analysis of law of Laplace.

ELECTROMAGNETS

Cylindrical vs. Tapered Core. External Field Produced by a Cylindrical Electromagnet, Cary T. Hutchinson and Harold Pender. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 9, Sept. 1920, pp. 822-830, 6 figs. States that for same volume of core and same number of ampere-turns, a tapered core will give a slightly greater magnetizing force, but difference is so small that it is doubtful whether the slight gain from a tapered core would justify the extra cost. Method of arriving at this conclusion is given in detail.

Heating of Coils. Maximum Temperature of Coils Traversed by Current (Die Höchsttemperatur stromdurchflossener Spulen), W. Rogowski and V. Vieweg. Archiv für Elektrotechnik, vol. 8, no. 9, Dec. 8, 1919, pp. 329-332, 3 figs. Reference is made to Vidmar's article in Elektrotechnik u. Maschinenbau (vol. 36, 1918, p. 65), in which he recommends that maximum temperature of coils carrying current be determined indirectly by measurement of mean and surface temperatures. Writer presents certain measurements carried out on one coil which he claims clearly demonstrate advantages and disadvantages of Vidmar's recommendations.

Self-Induction Coefficient. The Self-Induction Coefficients of Multi-Layer Coils (Ueber den Selbstinduktionskoeffizienten mehrlagiger Spulen), A. Esau. Jahrbuch Zeitschrift fur drahtlose Telegraphie u. Telephonie, vol. 15, no. 1, Jan. 1920, pp. 2-26, 5 figs. A formula is derived for a multi-layer coil in which distances between layers are different from winding spaces in each layer. Tables are given for simplifying calculation of self-induction coefficients of coils. Report from laboratory of the Wireless Telegraphy Co., Berlin.

[See also SOLENOIDS.]

ELECTROMETALLURGICAL INDUSTRIES

Washington State. Electrometallurgical and Electrochemical Industry in the State of Washington, Charles Denham Grier. Eng. Experiment Station, Univ. of Washington, Bul. no. 5, Mar. 1920, 45 pp. Statistics of developed water power and of potential water power, and its cost, with data on electric steel melting furnaces, and sodium nitrate production. Possibilities of manufacture of aluminum and electrochemical production of zinc are pointed out.

ELECTROMETALLURGY

Rare Metals. Progress in Electrometallurgy of Rare Metals (Neuerungen in der Elektrometallurgie der Edelmetalle), Franz Peters. Glückauf, vol. 55, nos. 47 and 49, Nov. 22 and Dec. 6, 1919, pp. 917-923 and 964-965. Notes on recent electrothermal, wet and cyanide processes, electroamalgamation, electrolytic purification and gold and silver electroplating.

ELECTROMETERS

Bispherical. Numerical Values of the Characteristics of the Absolute Bispherical Electrometer (Électromètre absolu bisphérique. Calcul numérique des ses caractéristiques), A. Guillet and M. Aubert. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 7, Feb. 16, 1920, pp. 385-387. Derivation of equations.

Dolezalek. Electrometric Tests (Ueber elektrometrische Untersuchungen), E. Schreiber. Annalen der Physik, vol. 59, no. 13, 1919, pp. 425-454, 18 figs. Review of experiments made in this direction by various authors and discussion of possible improvements in Dolezalek type of quadrant electrometer.

ELECTRON METAL

See MAGNESIUM ALLOYS, Electron Metal.

ELECTRON TUBES

Amplifying Rectifiers. Operation of an Electron Tube as an Amplifying Rectifier, Lewis M. Hull. Physical Rev., vol. 15, no. 6, June 1920, pp. 557-559. Rectification and amplification given by a tube are defined for both conditions of operation in terms of volt-ampere characteristics, and effects of tubes upon radio receiving circuit are considered separately.

Development. Development of Electron Tubes, Marius Latour. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 521-524, 8 figs. Various arrangements of tubes are analyzed to show what conditions are necessary for maximum am-

plification. Historical development of three-electrode tube is also discussed.

Generators. Electron Tube Generators of Alternating Currents of Ultra-Radio Frequencies, G. C. Southworth. Radio Rev., vol. 1, no. 12, Sept. 1920, pp. 577-584, 9 figs. Types of oscillators for producing very high frequencies and method of measuring wave length.

Modulated Waves. An Electron Tube Transmitter of Completely Modulated Waves, Lewis M. Hull. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 381, June 18, 1920, pp. 259-271, 7 figs. Transmitter set designed and built at Bur. of Standards. Set fulfills following requirements: (1) Use of single, type "P" pliotron, with 500-cycle, 150-volt alternator; (2) power output exceeding 200 watts in an antenna having 8 to 15 ohms resistance and natural wave length below 200 m.; (3) readily adjustable range of wave lengths from 500 to 1000 m.; (4) transmission of completely modulated waves, making possible their reception with crystal detectors; (5) sharply turned waves in order to avoid excessive interference over long series of tests.

Oxide-Coated Filament. Phenomena in Oxide-Coated Filament Electron Tubes, H. D. Arnold. Physical Rev., vol. 16, no. 1, July 1920, pp. 70-82, 1 fig. Thermionic phenomena in Wehnelt oxide electron tubes. Pure electron discharge; the influence of pressure and of bombardment by positive ions. Rate of evaporation of oxide coating.

[See also VACUUM TUBES, Characteristic Curves.]

ELECTRONS

Charge on. The Charge on the Electron and the Value of Planck's Constant h, Irving Langmuir. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 603-605. From equations derived by various experimenters and measurements of spectroscopic wave lengths, h is found to equal 6.481×10^{-27} erg-seconds.

Collision with Argon Atoms. An Experimental Determination of the Critical Electron Velocities for the Production of Radiation and Ionisation on Collision with Argon Atoms, Frank Horton and Ann Catherine Davies. Proc. Royal Soc., vol. 97, no. A681, Mar. 1, 1920, pp. 1-23, 9 figs. Describes experiments which are said to have shown that, when electrons bombard argon atoms, a radiation is first produced from the gas, when electrons attain a velocity of 11.5 volts, and that ionisation of gas occurs when electron velocity is further raised to 15.1 volts. It is concluded that, though presence of intense radiation may affect number of ionizing collisions which occur, minimum ionization velocity is same whether radiation to which argon atoms are exposed be weak or intense.

Emission. Comparison of Photo-Electric and Thermal Electron Emission (Vergleich der lichtelektrischen und thermischen Elektronenemission), A. Becker. Annalen der Physik, vol. 60, no. 1, Sept. 26, 1919, pp. 30-54, 1 fig. Writer reaches conclusion that relative distribution of voltage speed of electrons, which are released from platinum by photo-electric radiation with white light, is identical with that of the thermally released electrons.

Existence of. Method for Determining Density of Microscopic and Ultra-Microscopic Particles; Treatise on the Question of the Existence of the Electron (Ueber eine Met ode zur Bestimmung der Dichte von mikroskopischen und ultramikroskopischen Partikeln; ein Beitrag zur Frage nach der Existenz des Elektrons), R. Baer. Annalen der Physik, vol. 59, no. 13, 1919, pp. 393-408, 5 figs. Critical discussion of Ehrenhaft, Millikan, Targonski, Silvey, Meyer, Gerlach, Cunningham and other methods.

Motion of. The Dynamical Motions of Charged Particles, C. G. Darwin. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 537-551. Problem of motion of any number of charged particles, moving at high velocities in any electric and magnetic field is reduced to Lagrangian form and theorems of general dynamics are subsequently deduced. Influence on doublets of hydrogen spectrum due to finiteness of mass of nucleus of atom is calculated by Sommerfeld's quantum principle.

Radium and. Radium and the Electron, Ernest Rutherford. Nature, vol. 104, no. 210, Nov. 6, 1919, pp. 226-230. Survey of progress of atomic physics since 1869.

Reflection from Metal Surfaces. Reflection of Electrons from Metal Surfaces, H. M. Dadourian. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 434-439, 5 figs. Experimental results are interpreted to have shown that number of secondary electrons having velocities between zero and given velocity may be expressed as sum of two numbers, one of which is proportional to number of electrons having that given velocity and other proportional energy of X-rays in space between two plates having wave-length which according to quantum theory corresponds to given velocity.

Speed Distribution. Slow Positive Rays of Released Electrons (Ueber die von langsamen positiven Strahlen augelöten Elektronen), H. Baerwald. Annalen der Physik, vol. 60, no. 1, Sept. 26, 1919, pp. 1-29, 10 figs. Speed distribution of secondary released electrons and its dependence upon primary speed of released positive ray particles is discussed.

Spheroidal. The Spheroidal Electron, A. Anderson. London, Edinburgh and Dublin Philosophical Mag., vol. 39, no. 230, Feb. 1920, pp. 175-176. Expressions for momentum and energy in ether.

[See also ELECTRICITY, Modern Theories; Weyl's Theory.]

ELECTROPLATING

Analysis of Solutions. Analysis of Plating Solutions, Joseph Haas, Jr. Metal Industry (N. Y.), vol. 18, no. 9, Sept. 1920, pp. 412-414. Description of gallon assay method.

Brass. The Electrodeposition of Brass from Cyanide Solutions, Alfred L. Ferguson and Earl G. Sturdevant. Gen. Meeting Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 12, pp. 87-122, 7 figs. It is established as result of experimental work that increase in ratio of copper to zinc in solution increases percentage of copper in deposit, that solutions of high metal content are more satisfactory than dilute solutions, and that increase in temperature decreases cathode polarization and consequently increases percentage of copper in deposit.

Bronze, Deposition of. Bronze Plating, F. C. Mathers and Stanley Sowder. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 7, pp. 83-86. It was found in experiments that bronze can be deposited from bath containing potassium hydroxide 5 per cent, potassium cyanide 0.5 per cent, ammonium stannic chloride 0.38 per cent and potassium copper cyanide 1.5 per cent. Satisfactory corrosion of bronze anodes was obtained using temperature of 40 to 50 deg. cent. and current density of 3.75 amperes per square foot.

Copper. Metal Plating, W. G. Knox. Metal Industry (N. Y.), vol. 18, no. 1, Jan. 1920, pp. 14-15, 1 fig. Compilation of tables showing time required to deposit given thickness of copper.

Copper on Iron. Electro-Plating on Iron in Copper Sulphate Solution, Oliver P. Watts. Metal

Industry (Lond.), vol. 14, no. 21, May 23, 1919, pp. 428-430. It is said that certain lead and antimony may be substituted for arsenic dip, previous to direct-current plating of copper on iron from copper sulphate.

English Practice. Spoon and Fork Blanks, J. A. Morton. Metal Industry (New York), vol. 18, no. 7, July 1920, pp. 316-317, 5 figs. Defects in manufacture and their causes in English practice.

Experimental Work. Methodical Experimental Work in Electroplating, Joseph Hass, Jr. Metal Indus., vol. 17, no. 10, Oct. 1919, pp. 467-469. Emphasizes improvements of thorough and correct experimental work. Table of data to be observed and recorded when doing preliminary experiments is suggested.

Lead on Steel. Metal Plating, W. G. Knox. Metal Industry (N. Y.), vol. 18, no. 6, June 1920, pp. 264-266, 2 figs. Compilation of tables are presented showing time required to deposit a given thickness of lead. Notes on value of lead and lead-antimony for protection of iron or steel against corrosion.

Lead Plating. Lead Plating from Sodium Hydroxide Lead Baths by the Use of Addition Agents, Frank C. Mathers. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 5, pp. 35-39. Gum sandarac, gum galbanum, rosin and oleic acid were satisfactory addition agents for restraining crystalline structure of cathode deposits in alkaline lead baths. Other gums, rosins and fatty acids showed marked beneficial influences.

Military Uses. Military Applications of Electroplating, William Blum. Brass World, vol. 15, no. 10, Oct. 1919, pp. 312-314. Tentative classification of protective coatings suggested by Bur. of Standards. Paper presented before Am. Electrochem. Soc.

New Process. New Process of Galvanic Oxidation of Metals (Un nouveau procédé de décapage et d'oxydation galvaniques des métaux), L. Revillon. Revue de Métallurgie, vol. 16, no. 4, July-Aug. 1919, pp. 257-268, 2 figs. By means of bath form by solution of oxide of iron and concentrated alkali.

Nickel Plating. See ALUMINUM, Nickel Plating; ALUMINUM ALLOYS, Nickel Plating.

Silver and Cadmium. The Deposition of Silver and Cadmium, Chas. H. Proctor. Metal Industry (N. Y.), vol. 18, no. 1, Jan. 1920, pp. 13-14. Combination of these metals is recommended, which is said to reduce plating costs of articles of novelty type as well as electric fixtures, art goods, etc.

Structure of Metals. Factors Governing the Structure of Electro-Deposited Metals, William Blum. Can. Chemical Jl., vol. 3, no. 11, Nov. 1919, pp. 365-371. Experiments are claimed to have shown that Bancroft's "axioms of electroplating" are applicable over wide range of conditions and with variety of metals. It is, therefore, concluded that they may serve as guide in plating research and in practical plating operations.

Thickness of Electrolytic Deposit. Measurement of Layers of Metal of Minimum Thickness by Their Electromotive Force (Couches de métal, d'épaisseur minima, mesurées par leur force électromotive, Stephan Procopin. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1030-1031. Method based on fact that electromotive force of platinum covered with thin electrolytic deposit becomes invariable at known definite minimum thickness which varies for each metal.

ELECTROTHERAPY

Principles and Technique. The Physical Principles and the Technique of Electrotherapy (Die physikalischen Grundlagen und die Technik der Elektrotherapie), K. Bangert. Elektrotechnische Zeitschrift, vol. 40, nos. 41 and 42, Oct. 9 and 16, 1919, pp. 508-511 and 520-523, 7 figs. Suggests coöperation of physicians, physicists and technical engineers and outlines briefly a joint course based on physical principles. Some of the subjects discussed are: The human body as line resistance, qualitative and quantitative measurements, the electrodes, electro-medical apparatus, Röntgen rays, etc. Address delivered before Electrotechnical Society.

ELEMENTS

Chemical. See CHEMICAL ELEMENTS.

Metallic, Hydrides of. The Hydrides of the Metallic Elements, J. Frederick Corrigan. Chem. News, vol. 119, nos. 3112-3113, Dec. 5-12, 1919, pp. 259-260 and 273-275. Dec. 5: General method of formation and preparation. Dec. 12: General properties of hydrides.

ELEVATED RAILWAYS

Concrete Floors. Concrete Elevated-Railway Floor with Precast Form Slabs. Eng. News-Rec., vol. 85, no. 3, July 15, 1920, pp. 120-121, 3 figs. New type being applied to portion of Third Ave. elevated railway in New York City.

ELEVATORS

Accident Prevention in. Relative Seriousness of Elevator Hazards, Charles N. Young. Safety Eng., vol. 39, no. 4, Apr. 1920, pp. 199-201, 1 fig. From data given it is concluded that at least 60 per cent of elevator injuries with resulting time loss are preventable by properly safeguarding hazards involved, and that one-fourth of injuries could be prevented by standard shaftway gate and interlock protection. From Proc. of Am. Soc. of Safety Engrs.

Automatic Push-Button. Automatic Push Button Elevators, H. L. Keith. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 512-514, 5 figs. Their operation.

Bucket. See BUCKET ELEVATORS.

Electric. See Passenger.

Electric, Machinery. Electric Elevator Machinery —Thrust Bearings, M. A. Myers. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 378-381, 14 figs. Ball-type of thrust bearings as well as button and dish types are discussed. These types are divided into two classes, those which are located on each end of wormshaft and those located on free end of wormshaft only. Assembling of these thrust bearings and their adjustment is explained.

Grain. See GRAIN ELEVATORS.

Hydraulic. See Plunger Hydraulic.

Inspection. What Constitutes Proper Elevator Inspection, D. J. Gitto. Safety Eng., vol. 39, no. 4, Apr. 1920, pp. 189-191. Instruction for the inspection of machines, overhead, shaft and car. Writer believes that a car should never be operated and inspected by one and the same person. From Proc. of Am. Soc. of Safety Engrs.

Mechanical Interlocks. Mechanical Elevator Interlocks, Clayton W. Old. Safety Eng., vol. 39, no. 5, May 1920, pp. 249-251, 3 figs. Study of elevator shaft door accidents, their causes and current means of prevention. From Proc. of Am. Soc. of Safety Engrs.

Passenger. Electric Passenger Lifts, J. T. Towlson. Practical Engr., vol. 61, no. 1725, Mar. 18, 1920, pp. 135-138, 3 figs. Elevators at Bank Station of City and South London Railway. System of multiple-Vee friction drive is used.

Passenger Elevator Service, Howard B. Cook.

The Warner Elevator Manufacturing Co., Cincinnati, Ohio, 6 pp., 7 figs. Technical study of number and size of elevators required in a building. Calculations are based on rule that average elevator traffic for ten hours in an office building is equal to one passenger per hour in each direction for each 200 sq. ft. of rentable floor area in building. Paper presented at The Elevator Manufacturers' Assn. Convention.

Plunger Hydraulic. Care and Maintenance of Plunger Hydraulic Elevators, A. B. Burgess. Power, vol. 51, no. 3, Jan. 20, 1920, pp. 101-102, 6 figs. Suggestions in regard to reducing cost of maintenance.

Railway Cars. Inclined Elevator for Railway Cars (Schrägaufzug für Eisenbahnfahrzeuge), M. Mayer. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 11-12, June 15, 1920, pp. 116-117, 4 figs. Describes a simplification in which a two-axled carriage is so fastened under the lower axle of car that the car which runs with the wheels of its upper axle on the incline track remains approximately level.

Ropes. Reserve Strength of Elevator Ropes, W. Voigtlander. Safety Eng., vol. 39, no. 4, Apr. 1920, pp. 194-197, 7 figs. Gives results of tests of 6 × 19 ropes showing reserve strength, and illustrates method of socketing wire rope. From Proc. of Am. Soc. of Safety Engrs.

Safety Devices. Making Freight and Passenger Elevators Safe. Contract Rec., vol. 34, no. 25, June 23, 1920, pp. 612-614. Causes of accidents and their elimination. Paper read before Ontario Safety League.

Stacking. See FREIGHT HANDLING, Stacking Elevator for.

Worm Gears. Electric-Elevator Machinery. Worm Gears and Their Lubrication, M. A. Meyers. Power, vol. 52, no. 4, July 27, 1920, pp. 136-138, 6 figs. How to remove worm gear from elevator reduction gear is explained. Castor oil is recommended as best for lubrication.

ELLIPSOGRAPH

New Type. A New Ellipsograph (Ein neuer Ellipsenzirkel), H. Kaiser. Zeitschrift für Instrumentenkunde, vol. 39, no. 11, Nov. 1919, pp. 333-337, 4 figs. Describes a trammel of novel design for use of draftsmen.

ELLIPTIC ELEMENTS

Reduction to Weierstrass Form. Reduction of the Elliptic Element to the Weierstrass Form, F. H. Safford. Bul. Am. Math. Soc., vol. 26, no. 1, Oct. 1919, pp. 13-16. Simplification of Enneper's method (See Elliptische Functionen, p. 27) of reducing general elliptic element to Weierstrass form.

EMBANKMENTS

See EARTHWORK, Shrinkage of; RAILWAYS, Embankments.

EMERGENCY FLEET CORPORATION

Boilers for Wood Ships. See BOILERS, WATER-TUBE, E.F.C. Marine.

EMPLOYEES

Arousing Interest in. See INDUSTRIAL MANAGEMENT, Employees, Arousing Interest in.

Grading. See EMPLOYMENT MANAGEMENT, Grading Workers.

Medical Attendance. The Medical and Surgical Care of Industrial Workers, C. D. Selby. Eng. & Indus. Management, vol. 2, no. 22, Nov. 27, 1919, pp. 682-685, 3 figs. From bulletin prepared by Surgeon-General of U. S. Public Health Service, surveying efforts made throughout U. S. to deal with problems of injury and disease in industry.

Physical Examinations. See EMPLOYMENT MANAGEMENT, Physical Examinations.

Savings Systems for. Systematizing Thrift Among Employees, F. R. Hickman. Iron Age, vol. 105, no. 2, Jan. 8, 1920, pp. 133-134. Saving system operated by Locomobile Co. is said to prove effective.

The Solvay Thrift Plan for Industrial Employees, H. W. Jordan. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 543. Voluntary savings of employes deposited to individual accounts by weekly check from employing company.

Shop Magazines for. Gaging Employees' Magazine Results, John T. Bartlett. Am. Mach., vol. 53, no. 13, 1920, pp. 589-591. Writer tells of means of estimating results obtained by means of such papers, and also of means of getting results through them.

Some Functions of the Employees' Magazine, John T. Bartlett. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 385-388. Suggestions in regard to editorial policy to follow in publication of employees' magazine.

[See also WOMEN WORKERS.]

EMPLOYEES' REPRESENTATION

Advantages. Letting Your Employees do the Hiring. Factory, vol. 25, no. 1, July 1, 1920, pp. 41-44, 1 fig. Method of employee representation lowers labor turnover, assures adequate supply of labor and builds up in the minds of the workers feeling that they are part of the institution, writer believes.

Arbitration Plan. Industrial Conference Declares for Employee Representation. Indus. Management, vol. 59, no. 5, May 1920, pp. 348-354. Final report of second industrial conference held at Washington, D. C. Plan for inquiry and arbitration is presented. Greatest stress is laid upon joint organization of management and employees to secure coöperative effort. Plan of organization of nation-wide machinery of arbitration is outlined.

Argument Against. Industrial Democracy a Sham? Robert E. Newcomb. Iron Trade Rev., vol. 66, no. 8, Feb. 19, 1920, pp. 565-567. Usual form of organization of employees' and management's representatives is called "but a compromise with the bolshevik view of industrial management, leading eventually to soviet government of an industrial establishment."

Basis of. Coöperation and Industrial Progress, Cyrus McCormick, Jr. Met. Indus., vol. 17, no. 11, Nov. 1919, pp. 492-494. Suggested principles upon which employee representation should be based. Paper read before Nat. Safety Council.

Clark Equipment Co. Plan. Stimulating Coöperation Between Employer and Employee. Machy. (N. Y.), vol. 26, no. 6, Feb. 1920, pp. 544-550, 8 figs. Experience of Clark Equipment Co., Buchanan, Mich., where employees' representation plan is said to be successfully operating.

Colorado Fuel & Iron Co. Plan. Successful Trial of Industrial Representation Plan, E. S. Cowdrick. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 123-125. Colorado plan approved by employees and directors of Colorado Fuel and Iron Co. in 1915 after the bitter strike of 1913.

Experiences. Co-operation Tends to the Increase of Output. Iron Age, vol. 106, no. 3, July 15 1920, pp. 131-133. Replies received to inquiry sent to various metal-working companies as to their experience with employee representation plans. Several companies reported adoption of organization plans which resulted in

closer coöperation between management and employees.

Greenfield Tap & Die Corp. Workmen's Representation in a Tool Manufacturing Plant. Machy. (N. Y.), vol. 26, no. 11, July 1920, pp. 1007-1012, 3 figs. An account of the methods used and the results obtained by the Greenfield Tap & Die Corporation, Greenfield, Mass., in the application of workmen's representation in the plants of the corporation.

Organization. Workmen's Congress Solves Wage Problem. Iron Age, vol. 105, no. 24, June 10, 1920, pp. 1651-1653, 1 fig. Representative scheme organized at plant of Reliable Stove Co., Cleveland.

Passaic Metal Ware Co. System. Representative Government in a Manufacturing Plant, J. J. Calahan. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 256-258. Experience of Passaic Metal Ware Co. where system of management is modeled after government of United States. Senate, which is composed of foremen, heads of departments, or supervisors, elects whatever committees are needed. Employees throughout plant elect members of House, each class of workers being represented.

Plan for. Experiences in Industrial Democracy, F. L. Fluerbach. Elec. News, vol. 28, no. 24, Dec. 15, 1919, pp. 33-35. Account of application of internal government arrangement in large manufacturing plant.

Practical Aspects. Practical Aspects of Employees' Representation, E. B. Tolsted. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 410-412. Results accomplished by Works Committee. From Proceedings of Eighth Annual Safety Congress.

President's Industrial Conference. Employee Representation Indorsed. Iron Age, vol. 105, no. 13, Mar. 25, 1920, pp. 875-879. Final report of President's second industrial conference. Plan makes machinery available for collective bargaining with only incidental and limited arbitration. Conference places emphasis upon proposal for joint organization and management of employees as means of preventing misunderstanding and of securing co-operative effort.

Shop Committees. Conclusions as to Shop Committee Plans, Charles Morris Mills. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1445-1447. Results obtained by shop committees in various manufacturing plants are quoted. It is concluded that on the whole shop committees, for the short period of their existence, have accomplished much.

Development of Shop Committee Systems, Anice L. Whitney. Monthly Labor Review, vol. 9, no. 5, Nov. 1919, pp. 225-234. Types of plans in operation in England and U. S. A.

Elements of Success of Shop Committees, Charles Morris Mills. Iron Age, vol. 105, no. 18, April 29, 1920, pp. 1239-1240. Emphasizes necessity of freedom from superimposed spirit.

Industrial Democracy in Practice in England, Clarence H. Northcott. Automotive Industries, vol. 41, no. 25, Dec. 18, 1919, pp. 1197-1200. Operation of "joint standing industrial councils."

Laying the Cards on the Table, Fred H. Colvin. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 531-532, 2 figs. Advantages of shop-committee system established at plant of White Motor Co., Cleveland, Ohio.

One Year of Shop Committees, William Leavitt Stoddard. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 31-33. Summary of experimental movement in industry.

Serious Labor Problems in Cleveland, George Smart. Iron Age, vol. 106, no. 9, Aug. 26, 1920, pp. 515-517. Practical demonstration of working of shop committees.

Shop Committee Development Possible in Unionized Plant, Harry Tipper. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1224-1225. Successful development of shop committee in an English plant is quoted as showing possibilities of organizing shop committees in coöperation with unions.

Systems for Mutual Control of Industry, William L. Leiserson. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 24-25 and 82. Writer discusses various plans of employees' organization, and features of collective bargaining which he believes would contribute to its success and also those which he thinks would doom it to failure.

See also Works Councils.

Standard Oil Co. Plan. Employee Representation in Standard Oil, Burton Kline. Indus. Management, vol. 59, nos. 5 and 6, May and June, 1920, pp. 355-360 and 496-501. Scheme worked out following labor troubles of 1915. Employees meet regularly with management upon equal terms and discuss and adjust any questions that may arise as to wages, hours, working and living conditions.

Speeches at a Standard Oil Meeting of Employees' and Company's Representatives, Burton Kline. Indus. Management, vol. 60, no. 1, July 1920, pp. 1-8. Speeches made at joint annual meeting of employees' and Company's representatives. Subjects discussed were questions of coöperation between employers and employees, details of employees' representation, etc.

Status in United States. Employees' Representation in Management of Industry, Royal Meeker. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 1-14. Reference is made to establishment of Whitley plan in Great Britain and comparison is made of conditions in that country with those in U. S. Opinion is expressed that of the many systems of industrial democracy introduced in U. S. "very few give promise of accomplishing much in the way of winning enthusiasm and support of the workers, because little, if any, additional authority over or responsibility for methods and results is accorded them."

Trend of. Trends in Management, William Leavitt Stoddard. Factory, vol. 24, no. 9, May 15, 1920, pp. 1544-1546, 7 figs. Gives charts from which, it is said, progress in employee representation movement may be studied profitably.

Whitley Councils. Scope, Purpose and Effects of the Whitley Scheme, A. Rowland-Entwistle. Indus. Management, vol. 60, no. 1, July 1920, pp. 8-10. British scheme for effecting employees' representation in industrial plants.

The Operation of the Whitley Councils. Metal Industry (N. Y.), vol. 18, nos. 8 and 9, Aug. and Sept. 1920, pp. 367-368 and p. 416. History, development and present state of England's experiment in coöperation between employer and employee.

Whitley Plan in Fifty British Industries. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 16-18. It is reported that after more than two years of agitation, 50 industries have been organized according to Whitley plan.

Works Councils. Employee Representation in Industrial Plants, Magnus W. Alexander. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 121-122. Opinion is expressed that works council plan offers helpful method of securing better relationship between employer and employee.

Experiences in Industrial Democracy, F. L. Fluerbach. Elec. News, vol. 29, no. 1, Jan. 1, 1920, pp. 32-33. Application of internal gov-

ernment arrangement in large manufacturing plant.

Organization of a Works' Committee. Eng. and Indus. Management, vol. 4, no. 2, July 8, 1920, pp. 38-40, 1 fig. Description of workers' participation in shop management as carried out at works of Reliable Stove Co., Cleveland, Ohio. How wage adjustment was effected.

Some Experiences in Industrial Relations, Arthur H. Young. Factory, vol. 24, no. 2, Feb. 1, 1920, pp. 259-264. Eleven months' test of Harvester Co.'s industrial council plan, principal feature of which consists in establishment of Works Council for considering and shaping plant's policies with relation to matters of mutual interest to employers and employees.

Works-Councils in the United States. Metal Trades, vol. 11, no. 2, Feb. 1920, pp. 78-81. Summary of Report of Nat. Indus. Conference Board.

See also Shop Committees.

EMPLOYEES, TRAINING OF

Foremen. See FOREMEN, Training of.

Machinists. Correlation of Shop and Classroom Work in Training Machinists. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1463-1465, 3 figs. Course of apprentice machinists conducted by Goodyear Tire & Rubber Co.

Methods. Employment Management, A. Rowland-Entwistle. Eng. and Indus. Management, vol. 2, nos. 20 and 23, Nov. 13 and Dec. 4, 1919, pp. 622-624 and 723-724. Education and training of employees.

The Management and Training of Men, W. W. Gidley. Colo. School Mines Mag., vol. 9, no. 11, Nov. 1919, pp. 293-296; also Min. and Eng. Rec., vol. 24, no. 21, Nov. 15, 1919, pp. 342-345. Design, management, and training, as factors in linking together safety, efficiency, and democracy. Paper read before Annual Safety Congress.

Molders. Training Men in the Molding Art, R. R. Clarke. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 11-13. Suggests instilling in workmen under training desire to look for reason in all operations.

Moving Pictures. How Movies can Help You Train Workers, Alfred Pittman. Factory, vol. 25, no. 1, July 1, 1920, pp. 29-32, 5 figs. How a number of concerns have used the movies to recruit and train employees. Suggested uses.

Safety and Efficiency Training. The Management and Training of Men, W. W. Gidley. Universal Engr., vol. 30, no. 4, Dec. 1919, pp. 34-36. Importance of establishing departments in safety and efficiency particularly as means of promoting safety.

Specialized Jobs. Fitting Workers into Specialized Jobs, Peter F. O'Shea. Factory, vol. 24, no. 11, June 15, 1920, pp. 1884-1888, 1 fig. For each job, it is said, a set of job specifications is filled out and there is an instruction book containing complete exposé of successive operations on each job or on each machine, with intermediate steps such as inspection.

Success in. Results of Mastering Power Production, L. P. Alford. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 273-280, 9 figs. Instances are related which illustrate successful introduction of systematic training of workmen in factories.

Textbooks for. Text Books Used to Educate Employees. Iron Age, vol. 105, no. 5, Jan. 29, 1920, pp. 334, 335. Manuals prepared by Am. Inst. Corp.

Tin Mills. Making Tin Mills More Efficient, J. K. Lamoree. Iron Trade Rev., vol. 65, no. 25, Dec. 18, 1919, pp. 1642-1646. Education of workmen as means of increasing production.

EMPLOYERS' LIABILITY

See MINES, Accidents in.

EMPLOYMENT

See UNEMPLOYMENT.

EMPLOYMENT MANAGEMENT

Automobile Plants. Employment Department Increases Efficiency of Office Personnel, Norman G. Shidle. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 576-578, 9 figs. Results obtained by applying effective personnel methods in office work at large automobile plant.

Bibliography on. Progress in Industrial Personnel, Eugene J. Benge. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 541-543, 3 figs. Bibliography including articles in current journals, military publications and books.

Charts. Practical Personal Management, Earl B. Morgan. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 122-129, 16 figs. Forms and charts used at employment and service department, Curtis Publishing Co.

Community Policy. Permanent Employment Is Assured, Pat Dwyer. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 1-5, 7 figs. Labor policy in large steel foundry, patterned on community lines but more free in its interpretation forms.

Development of Department. How an Effective Employment Department Is Being Developed, Norman G. Shidle. Automotive Industries, vol. 43, no. 8, Aug. 19, 1920, pp. 370-373, 7 figs. It is said that large expenditures and elaborate equipment are not essential to successful operation of employment department, and that intelligent vision and progressive development are of more importance. System of records in use in employment department of Detroit automobile manufacturer is explained.

Federal Personnel Policy. A Federal Personnel Policy, W. E. Mosher. Monthly Labor Rev., vol. 11, no. 1, July 1920, pp. 11-25, 1 fig. Based on report of Congressional Joint Commission on Reclassification of Salaries. Sketch of organization for personnel administration.

Forms Used. How One Manufacturer Handles Labor, Robert I. Clegg. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 27-31, 25 figs. Forms used by employment department of Graton & Knight Mfg. Co.

Grading Workers. Standardizing the Job, M. R. Lott. Factory, vol. 24, no. 1, Jan. 1920, pp. 54-55, 2 figs. Suggests method of grading workers.

Hiring Men, Methods of. Methods of Hiring and Training Men, Henry S. Day. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 447-451, 6 figs. Methods used by Mechanical Department of Kansas City Railways.

Industrial Relations and. Employment Management and Industrial Relations, Dudley R. Kennedy. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 353-358. Emphasizes that no industrial relations work can succeed without proper motive behind it.

Industrial Training and. Employment Management and Industrial Training, Roy W. Kelly. Federal Board for Vocational Education, bul. no. 48, Oct. 1919, 106 pp. Economical and social losses resulting to nation from lack of education or faulty education of wage earners in industry are pointed out, together with more important difficulties to be overcome in preventing them, and practical methods are suggested by which industries and educational institutions may coöperate in industrial training.

Influence on Production. See INDUSTRIAL MANAGEMENT, Production Methods.

Inspectors, Grading of. Materials for Mass Production, E. A. Allcut. Eng. & Indus. Management, vol. 3, no. 1, Jan. 1, 1920, pp. 21-22, 1 fig. Concerning relative grading of inspectors and amount of responsibility to be borne by each grade.

Interviewing Applicants. The Art of Interviewing, R. T. Fennell. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 310-311. Requirements of successful interviewing.

The Art of Interviewing Applicants, Russell J. Waldo. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 273-277, 14 figs. Procedure followed in employment department of representative firms. System of keeping records of applicants.

Labor Turnover. See LABOR TURNOVER.

Physical Examinations. Making Examinations Universal, T. E. Jennings. Iron Trade Rev., vol. 66, no. 4, Jan. 22, 1920, pp. 284-285. Writer believes that physical examination of all employees will reduce losses from labor turnover, conserve man power and prove advantageous to employer and workmen. Objections of labor are answered.

Psychological Qualifications. Practical Results from Industrial Psychotechnology (Praktische Ergebnisse aus der industriellen Psychotechnik), H. Schlesinger. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 23-24, June 12, 1920, pp. 417-424, 17 figs. It is shown that psychological qualification investigations are a practical means of finding the right man for the right occupation. Notes on apparatus used to test sight and touch; examination of attentive and imaginative faculty; of constructive talent and technical understanding. Comparison between results from laboratory and workshop, and data on special cases, such as chauffeurs, telephone workers, etc.

Rating Employees. Charts That Help Pick the Right Man for the Job. Factory, vol. 25, no. 3, Aug. 1, 1920, pp. 383-384, 1 fig. Rating scale worked out at plant of Westinghouse Electric & Manufacturing Co.

Mutual Rating, Henry Wood Shelton. Bul. Taylor Soc., vol. 5, no. 2, Apr. 1920, pp. 59-67, 3 figs. Experience of Emergency Fleet Corporation.

Policy and Shop Rules Adopted by the Shipyards and Commercial Shops of the Bay District. Metal Trades, vol. 2, no. 1, Jan. 1920, pp. 16-18. Classification of positions and wages assigned to each are included.

Records. Aids for the New Employment Manager, F. Morgan Keyser. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 245-247, 2 figs. Suggested forms for recording term of service and for showing total separations by periods.

Visualizing Employment Records, W. S. Wells. Indus. Management, vol. 60, no. 1, July 1920, pp. 67-70, 6 figs. Method of keeping records at Newburgh Shipyards.

Selecting Employees. Choosing the Worker, B. Muscio. Eng. & Indus. Management, vol. 3, no. 1, Jan. 1, 1920, pp. 5-9. Emphasizes importance of bringing about precise adaptation of worker to his work.

Organization, G. W. Good. Off. Proc. Car Foremen's Assn. of Chicago, vol. 15, no. 1, Sept. 1919, pp. 12-34. Emphasizes importance of selecting men for positions on basis of their fitness.

Testing Employees. Investigation of Vocational Qualifications (Untersuchungen über Berufseignung), H. Schlesinger. Deutsche optische Wochenschrift, nos. 5-6, Feb. 2, 1920, pp. 39-43, 12 figs. Description of apparatus and methods of testing physical qualifications of employees.

Practical Results in Industrial Psychotechnics, H. Schlesinger. Eng. and Indus. Management, vol. 4, no. 11, Sept. 9, 1920, p. 333. Method of testing capabilities of youths for industrial occupations at Industrial Psychotechnics Department of Charlottenburg Technical High School, Germany. Translated from Zeitschrift des Vereines deutscher Ingenieure.

Psycho-Technics in Germany, Alfred Gradenwitz. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 407-408, 6 figs. Apparatus used in German laboratory to pick out right man for job.

Vocational Tests, Cyril Burt. Eng. & Indus. Management, vol. 4, no. 6, Aug. 5, 1920, pp. 166-169. Importance of "putting the right man in the right job." Lecture delivered at Psychological Laboratory, Cambridge University.

Vocational Tests. See Testing Employees.

Westinghouse Elec. & Mfg. Co. Methods. Westinghouse Employment Department, John C. Bower. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 243-246, 8 figs. Methods used by Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., in hiring men and in retaining working force. Records kept in employment department are illustrated.

Works Rules. Works Rules and Regulations, H. Varley. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 659-662. Rules for regulation of works and offices of Makor Brake Mfg. Co., Ltd.

[See also EMPLOYEES, TRAINING OF; PROFIT SHARING, Plans for.]

EMULSIFICATION

Adsorption and. Emulsification by Adsorption at an Oil-Water Interface, S. E. Sheppard. Jl. Phys. Chem., vol. 23, no. 9, Dec. 1919, pp. 634-639, 3 figs. Experiments are said to have agreed with Bancroft's general theory of peptization that adsorption at a liquid, liquid interface is capable of procuring emulsification.

ENAMELING

Blistering, Prevention of. The Cause and Control of "Blistering" in Sheet-Steel Enameling, Chester Treischel. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 774-781, 5 figs. From results of experiments it is concluded that hydrogen has much to do with blistering in sheet-steel enameling. Blistering observed in reflectors which were pickled in strong solution of acid is attributed to high concentration of liberated ions.

Cast-Iron Wares. Materials and Methods Used in the Manufacture of Enameled Cast-Iron Wares, Homer F. Staley. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 142, Dec. 20, 1919, 158 pp., 5 figs. Enameling of cast iron by dry process.

Cleaning Metals for. The Electric Cleaning of Metals for Enameling Purposes, W. C. Lindemann. Jl. Am. Ceramic Soc., vol. 3, no. 3, March 1920, pp. 252-255. Practice of A. J. Lindemann & Hoverson Co. Advantages claimed for electric process are lower cost, saving in time with corresponding greater output, elimination of oxide sludge, elimination of sponging on scrubbing of ware.

Enamel-Lined Apparatus. The Manufacture of Enamel Lined Apparatus, Emerson P. Poste. Jl. Am. Ceramic Soc., vol. 2, no. 12, Dec. 1919, pp. 944-976, 34 figs. Deals with manufacture of steel and cast-iron apparatus, including by way of contrast details relative to other types of enamels.

ENAMELS

Acids, Action of. Relative Action of Acids on Enamels. Jl. Am. Ceramic Soc., vol. 3, no. 7, July 1920, pp. 560-567, 1 fig. Report of recent investigations.

Application in Quantity Production. Lacquers and Lacquer Enamels for Finishing. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 72-76, 9 figs. Describes how lacquers are made and different methods by which they are applied to all kinds of goods in quantity production.

Titanium. Titanium Enamels, Robert D. Landrum and Leon J. Frost. Jl. Am. Ceramic Soc., vol. 3, no. 4, April 1920, pp. 316-321, 2 figs. It is concluded from results obtained in trials that too high content of TiO_2 increases specific gravity of frit to such an extent that it is extremely difficult to keep it in a saisfactory state of suspension by ordinary means. Other investigations were undertaken regarding opacity and ground coat properties of titanium enamels.

Volatilization of Iron in. The Influence of Metal Chlorides on the Volatilization of Ferric Oxide in Enamel (Einfluss von Metallchloriden auf die Verflüchtigung von Eisenoxyd in Emails). Sprechsaal, vol. 53, no. 29, July 15, 1920, pp. 298-299. States that it is established beyond doubt that no volatilization of iron takes place until the melting temperature of the admitted chloride is reached.

ENERGY

World's Supply. The Problem of the World's Supply of Energy, Svante Arrhenius. Chem. & Met. Eng., vol. 23, no. 2, July 14, 1920, pp. 67-69. Predicts that early exhaustion of fossil fuels will require use of other sources—water, wind and sun power; continual increase of CO_2 in atmosphere will reforest temperate zones and drive civilization back to its birthplace—Mesopotamia, the Mediterranean, Central America and Peru. Paper delivered on being awarded Franklin medal by Franklin Inst.

ENGINEER CORPS, U. S. A.

Activities in France. Engineer Troops in an Advance, G. B. Pillsbury. Prof. Memoirs, Corps of Engrs., U. S. Army & Engr. Dept. at Large, vol. 11, no. 60, Nov.-Dec. 1919, pp. 675-694. Account of activity of Engineer Corps of A. E. F.

Operations in France. Engineer Operations in France, A. H. Lovell. Michigan Technic, vol. 32, no. 3, Oct. 1919, pp. 173-181, 4 figs. Duty of officers in Engineers' Corps of army and notes on organization of Corps.

ENGINEERING

Definitions. A Study of Definitions of "Professional Engineer" and "Engineering," A. D. Flinn, with collaboration of A. W. Kiddie and H. W. Craver. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 96-102. Definitions gathered from various sources.

Economics of, Fundamental. See ECONOMICS, Engineering.

Forest Products Laboratory and. See LABORATORIES, Forest Products.

ENGINEERING SCHOOLS

Coöperative Course. A New Coöperative Course in Electrical Engineering, W. H. Timbie. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 784-790. Coöperative course given by General Electric Co. and Massachusetts Institute of Technology. Practical training is given in six thirteen-week periods during last three years of five-year course.

ENGINEERING SOCIETIES

Federated American Engineering Societies. Am. Soc. C. E. Arguments For and Against Federation. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 663-665. Membership receives presentation of opposing views prior to voting on question of joining the new organization.

Federated American Engineering Societies, L. P. Alford. Indus. Management, vol. 60, no. 1, July 1920, pp. 53-55.

Federated Engineering Societies of America, Arthur P. Davis. Eng. World, vol. 17, no. 3, Sept. 1920, pp. 198-201. Reasons for establishing Federated Engineering Societies. Work Federation will accomplish. Why this work cannot be accomplished by any other society.

Organizing Conference Plans Federation of Engineering Societies. Mech. Eng., vol. 42, no. 7, July 1920, pp. 422-423. Also in Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 690-692, and Min. and Metallurgy, no. 163, July 1920, pp. 7-13. Account of conference of 71 engineering organizations and allied technical societies, held at Washington on June 3, and 4. A new organization, The Federated American Engineering Societies, was created, which is to represent profession in matters of common concern and in national and state affairs.

Organization. How Other Professions Than Engineering Are Organized, Charles Whiting Baker. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1250-1254. Methods employed by lawyers, doctors, and architects to secure united action by large memberships.

Technical Publications. Co-Ordination of Technical and Scientific Publications. Eng., vol. 110, no. 2846, July 16, 1920, p. 80. Suggests in order to meet "difficulty of keeping track of all that is written on a given subject," so much increased of late because "multiplication of societies and the great activity of all departments of science and engineering have given rise to an ever-increasing volume of publications containing information, often of interest and sometimes of great value, to those engaged in occupations on which they have a bearing," that every institution and society publish a fairly full abstract of their papers printed in its ordinary proceedings, such abstracts to be uniform for all institutions in regard to size of page and width of margins.

[See also ENGINEERS, National Organization.]

ENGINEERS

Business Training for. Commercial Engineering, Glen Levin Swiggett. Department of the Inter. Bur. of Education, bul. 1919, no. 58, 180 pp., 5 figs. Report of conference on business training for engineers and engineering training for students of business.

Chemical. The Chemical Engineer, J. H. West. Chem. Trade Jl. & Chem. Engr., vol. 66, no. 1724, June 5, 1920, pp. 727-730. Also in Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 333-336. Writer analyzes functions of chemical engineers in relation to chemical manufacture, classifies these functions into their various groups, discusses various sources from which chemical engineers of future are likely to come, and offers some suggestions as to training they will require, and how this is to be provided.

The Training of the Chemical Engineer, R. F. Ruttan. Jl. Eng. Inst. Can., vol. 3, no. 3, Mar. 1920, pp. 123-127. Describes specialization in Great Britain and discusses specialization vs. a broad training. Points out essentials in curriculum. Notes on Boston plan. Adaptations to Canadian conditions.

Civic Activities, Italy. The National Convention of the Italian Engineers at Naples (Il convehno nazionale degli ingegneri italiani a Napoli). Associazione nazionale degli Ingegneri italiani Giornale ufficiale, vol. 1, no. 21, July 30, 1920, pp. 157-161. Summary of proceedings of National Convention of Italian Engineers held at Naples, May 20 to 25, 1920. One of topics discussed was, "Civic Activities of Engineers."

Classification of. Classification and Compensation of Engineers as Proposed by Engineering Council Committee. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, pp. 41-45, 1 fig. Eight grades are defined, five professional and three sub-professional, and necessary qualifications are specified. Investigations of Committee are represented as having shown "lack of any adequate or consistent employment policy with respect to professional engineers."

Classification and Compensation of Engineers. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 138-140. Report of Engineering Council committee proposing classification of engineering positions in federal, state, country, municipal and railroad services.

Federal Engineers Classified as to Duties and Pay. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 780-781. From report covering all government employees at Washington submitted to Congress by Keating Commission.

Compensation, Holland. Report of the Committee for Regulating the Scale of Remuneration of Consulting Engineers in Holland (Vereeniging van Delftsche Ingenieurs: Verslag der Commissie tot het herzien der Honorariumtabellen). Ingenieur, vol. 35, no. 24, June 12, 1920, pp. 407-411. Remuneration scale forms percentage of cost of works and decreases gradually as total cost of work increases.

Compensation of. Compensation for Engineers, O. C. Merrill. Professional Engr., vol. 5, no. 5, May 1920, pp. 14-15. Remark of Prof. Irving Fisher before governors and mayors assembled at White House March 3-5, 1919, that the nation is "on a permanently higher price level," is quoted and it is urged that salary scales be revised along sound principles and "in full recognition of present-day conditions." Activities of Engineering Council in the study of situation in this respect of engineers in federal, state and municipal service, are related.

Engineering Council's Committee Reports on Compensation of Engineers. Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 117-121, 1 fig. Presents uniform grading plan for "professional" and "sub-professional" services. Standard salary schedule is submitted and duties and titles are defined.

Low Pay of City and State Engineers Disclosed by Answers to Questionnaire. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 217-221. Report of State, County and Municipal Sections of Engineering Council Committee on Classification and Compensation of Engineers, based on statements from engineers in service of 35 states and 66 cities in United States.

See also Classification.

Coöperation Among. Coöperation among Engineers, F. H. Newell. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 732-733. Points out how engineers may best coöperate and for what reason they should coöperate. From address before Ohio Assn. of Tech. Socs.

Definitions of. A Study of Definitions of "Professional Engineer" and "Engineering," Alfred D. Flynn, W. Kiddle and Harrison W. Craver. Jl. Eng. Inst. of Canada, vol. 3, no. 8, Aug. 1920, pp. 387-392. Results of labors of Engineering Council's Committee on Licensing of Engineers while framing model bill for registration of engineers.

Education of. Some Forces in Engineering Education, Homer A. Watt. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 771-773. It is emphasized that "engineer cannot play his part by the side of educated professional men without a broader training in history, English and the social sciences," and it is therefore stated that "the engineering college which neglects the cultural elements in its curriculum will find itself, in a few years, only an industrial school."

The Education of Engineers in Industrial Works (La formation des ingénieurs par le stage en usine), L. Linder. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 131, no. 5, Sept. and Oct. 1919, pp. 217-232. Organization created by the Société d'Encouragement for the purpose of providing opportunities for technical education of young men while being demobilized from army.

See also EDUCATION, ENGINEERING.

Future Opportunities and Obligations. Future Opportunities and Obligations of Engineers, George W. Fuller. Jl. Boston Soc. Civ. Engrs., vol. 6, no. 10, Dec. 1919, pp. 341-352. Writer praises efforts of National Engineering Societies in furthering proposed Nat. Dept. of Public Works, and further observes that "it is necessary to create and maintain and strengthen a wide appreciation of the opportunities of engineers to play, at this particular period, a full part in a betterment program for the future."

Governmental Responsibility. The Engineer's Responsibility for Efficient Government, Frederick P. Gruenberg. Jl. Engrs. Club, Philadelphia, vol. 36, no. 180, Nov. 1919, pp. 423-426. Because, writer notes, with increasing complexity of government a trained public service is indispensable, and "if democracy is to succeed, the old tradition of putting the politician in the technical administrative post must soon cease, and democracy must look to the professional public servant to take up the burden."

Industrial. Industrial Engineers' Opportunity, L. W. Wallace. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 462-464. Writer places principle of honesty, fairness and justice in forefront of fundamentals that should govern relations of employers and employees. Future of industrial expert is visualized as presenting great opportunities with ever increasing demand for production.

The Engineer in Industry, J. Parke Channing. Min. & Sci. Press, vol. 119, no. 18, Nov. 1, 1919, pp. 635-637. Address delivered at dedication of Pittsburgh Experiment Station of U. S. Bur. of Mines.

Industrial Relations of. Industrial Relations of Engineers, H. H. Higbie. Michigan Technic, vol. 33, no. 1, March 1920, pp. 23-28. Because the engineer "is usually the connecting link between capital and labor," and because he "has the trained intelligence and innate respect for verities which are essential to correct and lasting solution of the difficult relation of capital and labor," it is concluded that it is distinctly his duty to formulate a solution of social problems "which shall conform just as closely to psychological and normal laws as his usual plans and specifications conform to physical laws."

License Law, British Columbia. British Columbia's "Engineering Profession Act." Can. Engr., vol. 38, no. 22, May 27, 1920, pp. 511-514. Complete text of act passed by legislature of British Columbia relating to practice of engineering profession in that province.

Licensing. Legislation Governing Practice of Engineers. Contract Rec., vol. 34, no. 33, Aug.

18, 1920, pp. 784-787. Act recently passed in Nova Scotia.

Military, Work of. Engineering Battalions: Their Work in the War, Arthur W. Currie. Can. Engr., vol. 38, no. 7, Feb. 12, 1920, pp. 203-210. Review of engineer services in regard to defences, roads, tramways, water supply, mining and tunnelling, bridging, searchlights, etc. Address to Dominion Land Surveyors' Association.

National Organization. The Proposed Comprehensive Organization of National, Local, State and Regional Engineering Societies for the Advancement of the Welfare of the Engineers, Edward J. Cattell. Jl. Engrs. Club of Phila., vol. 37-5, no. 186, May 1920, pp. 209-215. Addresses made by President of Am. Soc. of Mech. Engrs., Am. Soc. of Civil Engrs., and Am. Inst. Electrical Engrs. and a Past President of the Am. Inst. of Min. & Metallurgical Engrs.

Need of, in Government Administration. The Engineering National Affairs, Herbert C. Hoover. Chem. & Met. Eng., vol. 22, no. 7, Feb. 25, 1920, pp. 349-352. Writer suggests outline of national policy with regard to railroads, shipping and industrial relations, and points out need of engineering thinking in Government administration. Presidential address at meeting of Am. Inst. Min. & Met. Engrs.

Participation in Civic Affairs. Responsibilities of Technical Men and Obligations of the People, Warren G. Harding. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 309-310. Opinion is expressed by writer that "representatives of the engineering professions should sit in our state and national legislative bodies, instead of being merely the administrative agents of the great engineering projects that our intensive civilization now demands shall have greater fruition."

Political, Profession of. The Engineer as a Public Servant, William S. Twining. Jl. Engrs. Club of Philadelphia, vol. 37, no. 185, April 1920, pp. 165-170. Suggests that profession of "political engineer" be created "for the purpose of applying the principles of engineering to political affairs." It is emphasized that "evident dissatisfaction with government which exists all over the world today" is caused because machinery of government is lagging behind requirements of different nations in supplying adequate and satisfactory service to communities governed.

Relations with Cities. Coöperation among Cities Ensures Better Relations with Engineering Profession, Charles A. Mullen. Contract Rec., vol. 33, no. 53, Dec. 31, 1919, pp. 1203-1206. Points out advantages of union in securing a centralizing bureau and a clearing house of information.

[See also INDUSTRIAL RELATIONS, Engineer and Personnel.]

ENGINEHOUSES

Ashpits for. Railway Ashpits of New Design. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 1007-1008, 3 figs. Sides are vertical instead of sloping and ash-car track is on center line instead of being outside pit.

Design. Modern Tendencies in Roundhouse Design, Exum M. Haas. Jl. Western Soc. Engrs., vol. 24, no. 9, Nov. 1919, pp. 567-569 and (discussion) pp. 569-583, 8 figs. Structural details of typical roundhouse.

Mallet Compound Locomotives. An Engine House for Mallet Compound Locomotives. Ry. Age, vol. 68, no. 26, June 25, 1920, pp. 1975-1976, 2 figs. Eight-stall engine house with total depth of 120 ft. from center of columns of inner circle to inside of wall at back. It is constructed upon concrete foundations with concrete engine pits 90 ft. long and floor of same material.

Oil Storage in. Oil Storage Facilities, Stark Engine Terminal, P. R. R. Lines West. Ry. Rev., vol. 66, no. 3, Jan. 17, 1920, pp. 86-90, 8 figs. Oil house is of brick on concrete foundation, 71 ft. 5 in. long by 41 ft. 5 in. wide, including platform 12 ft. wide. Roof consists of 4-in. and 5-in. reinforced concrete slabs, supported on reinforced-concrete girders and beams and overlaid with prepared sheet roofing.

Pennsylvania Lines. Stark Engine Terminal, Pennsylvania Lines West. Ry. Rev., vol. 66, no. 1, Jan. 3, 1920, pp. 1-11, 22 figs. Installation consists of Pennsylvania lines west standard type A roundhouse, main bay of which is built with steel framework offering clear span of 75 ft. in which is installed circular traveling crane. Attention is directed to down-take system of smoke collection and elimination.

San Bernardo, Chile. Round Houses of San Bernardo, Chile (Maestranza de San Bernardo en Chile), Carlos Valenzuela Cruchaga. Ingeniería Internacional, vol. 4, no. 4, Oct. 1920, pp. 202-213, 13 figs. Central shop where repair work for Chilean State Railways is conducted.

Standard Designs. A Unit Construction Method for Engine Houses. Ry. Age, vol. 65, no. 24, June 11, 1920, pp. 1663-1667, 6 figs. Standard designs developed by Pennsylvania system.

ENGLISH

Factory Training in. Preparing Industrial English Lessons, George F. Quimby and Charles H. Paull. Indus. Management, vol. 59, no. 3, March 1920, pp. 231-236, 3 figs. Lessons prepared by Industrial Service Department of Associated Industries of Massachusetts and Bureau of Vocational Guidance at Harvard University, which have been working coöperatively on industrial Americanization projects during past year.

Trade Language. See EXPORT TRADE, English as World Language.

ENGRAVING MACHINES

Universal. An Engraving and Profiling Machine. Engr., vol. 129, no. 3364, June 18, 1920, pp. 630-631, 4 figs. Machine is said to be capable of forming characters varying in height from 2 in. to 1-32 inch and to be able to engrave either "plain sunk" or in relief.

ENTROPY

See THERMODYNAMICS, Entropy.

EQUATIONS

Differential. Family of Multiform Functions Which are Integrals of a Differential Equation of the First Order (Sur une famille de fonctions multiformes, intégrales d'une équation différentielle du premier ordre), Pierre Bouthroux. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 635-637. Singularities of derived functions.

Principal Solution of a Certain Equation Having Finite Differences (Sur la solution principale d'une certaine équation aux différences finies), N. E. Nörlund. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 10, Sept. 8, 1919, pp. 462-465. Second member of equation being function which admits derivative of order determined by uniform convergency of discriminating series.

Transformations of Linear Equations with Partial Derivatives Involving Two Independent Variables (Sur les transformations des équations linéaires aux dérivées partielles à deux

variables indépendantes), G. Cerf. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 14, Oct. 6, 1919, pp. 613-615.

ESPERANTO

Commercial Use. A Common Language of Commerce, W. R. Daingerfield. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 414-415. Efforts being made to assist interchange of ideas among commercial and technical men of every land through Esperanto.

ETHER

Equation of State of. Equation of State of Ether (L'équation d'état de l'éther), E. Aries. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 15, Apr. 12, 1920, pp. 871-875. Calculation of coefficients in formula, at various temperatures up to 193.8 deg. cent., the critical temperature of ether.

Stokes-Planck Theory. See RELATIVITY, Einstein's Theory.

[See also WAVE MOTION, Mechanics of.]

ETHYL CHLORIDE

Technical Applications. The Technical Applications of Ethyl Chloride, Albert Henning. Jl. Soc. Chem. Industry, vol. 39, no. 1, Jan. 15, 1920, pp. 1T-8T, 5 figs. Applications are pointed out (1) in synthesis of dyestuffs and drugs, (2) as working substance in refrigerating machinery, (3) as solvent for extraction purposes, and (4) in research work and in laboratory practice.

[See also REFRIGERATION, Ethyl Chloride.]

ETHYLENE

Recovery from Coal. Recovery of Ethylene from Coal. Colliery Guardian, vol. 120, no. 3112, Aug. 20, 1920, pp. 533, 1 fig. Process for treatment of gaseous products from coke ovens, patented jointly by Ernest Bury and Skinningrove Iron Co., Ltd.

[See also ALCOHOL, Ethylene from Coke-Oven Gas.]

EVAPORATORS

Air-Pump Capacities Required. Air-Pump Capacities and Incondensable-Gas Volumes in Industrial Vacuum-Evaporator Plant, Edward Corner. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 74-75, 3 figs. Theoretical principles implied in derivation of empirical formulæ.

Commercial. Modern Commercial Evaporators, W. L. Badger. Michigan Technic, vol. 32, no. 3, Oct. 1919, pp. 186-200, 7 figs. Design calculations.

Design. Studies in Evaporator Design, W. L. Badger, P. W. Shepard and E. M. Baker. Chem. & Metallurgical Eng., vol. 23, nos. 6, 7, 9 and 12, Aug. 11 and 18, and Sept. 1 and 22, 1920, pp. 237-241, 281-284, 390-393 and 569-574, 11 figs. Aug. 11 and 18: Effect of temperature drop and temperature level on heat transmission in vertical-tube evaporators. Corrections for hydrostatic head. Boiling points, heat drops and steam temperatures as factors. Sept. 1: Effect of hydrostatic head on heat transmission in vertical-tube evaporators. Method of manipulation and accuracy of results. Maximum heating one-third tube depth. Sept. 22: Investigation of boiling points of salt solutions. Critical examination of vapor pressure and temperature data given in literature, checked by determinations. Charts and tables on salt solutions. Paper read before Am. Inst. Chem. Engrs.

Efficiency of. Effect of Oil Content of Exhaust Steam on Efficiency of Heating Surface of Evaporator (Die Einwirkung des Oelgehaltes des Abdampfes auf die Leistung der Verdampferheizfläche), H. Classen. Zeitschrift des Vereins der deutschen Zucker-Industrie, no. 758, Mar. 1919, pp. 128-135, 1 fig. It is concluded that oil content of steam has certain effect on heating surface; extent of oil deposits in tubes is found to depend on grade of oil used.

Electric. Electric Evaporators, "Autovapor" System (Elektrische Eindampfanlagen, System Autovapor), E. Wirth. Bulletin Association Suisse des Electriciens, vol. 10, no. 12, Dec. 1919, pp. 349-355, 7 figs. Describes method in which vapor given off is heated by being compressed in an electrically driven compressor and circulated through a coil, evaporator causing further evaporation.

Experiment Station. The Evaporator Experiment Station at the University of Michigan, W. L. Badger and P. W. Shepard. Chem. and Metallurgical Eng., vol. 23, no. 4, July 28, 1920, pp. 159-164, 8 figs. Account of institution of the evaporator laboratory, description of vertical, horizontal and semi-film evaporators and miscellaneous equipment, and program of investigations proposed.

Heating-Surface Efficiency. Efficiency Determination of Evaporator Heating Surfaces (Ueber Verdämpfer und die Bestimmung der Leistung ihrer Heizflächen), H. Claassen. Zeitschrift für angewandte Chemie, vol. 32, no. 62, Aug. 5, 1919, pp. 241-246, 3 figs. Purpose of article is to establish basis for determination and calculation of practical coefficient of heat flow and certain rules for carrying out efficiency tests in evaporation systems.

[See also HEAT PUMPS.]

EXCAVATING MACHINES

Dragline. Deep Pit Rock Excavation by Dragline Machines. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 196-199, 5 figs. Operating ranges of 175 ft. horizontally and 100 ft. vertically are said to have been found practicable in rock cuts for Miami Valley flood-retarding dams.

Electrical Operator. Electrically-Operated Excavating Machines (Machines d'extraction à commande électrique), G. Hacault. Revue générale de l'Electricité, vol. 6, nos. 16, 17, 18 and 19, Oct. 18 to 25, and Nov. 1 and 8, 1919, pp. 507-512, 553-565, 585-594 and 623-637, 75 figs. Description of installation consisting of machine having cylindrical drums and operated by three-phase asynchronous motor. Advantages of electrical operation are discussed from viewpoint of efficiency and convenience. Alternating-current controllers; comparison of various systems of controlling.

German. Excavating Machines in Lignite Surface Mines (Grabenbagger in Braunkohlentagebaubetrieben). Braunkohle, vol. 18, nos. 41 and 42, Jan. 10 and 17, 1920, pp. 527-533 and 545-548, 22 figs. Machines constructed by the firms of Orenstein & Koppel, Berlin, and the Lübeck Machine Construction Co., Lübeck, with and without ramp cutters, consisting of bucket elevator excavator mounted on caterpillar tractor and provided with belt conveyors discharging at each side of machine.

EXCAVATION, EARTH

Building Basement. Basement Excavation After Building Erection Was Well Advanced. Eng. & Contracting, vol. 53, no. 24, June 16, 1920, p. 686, 3 figs. Describes work done by a Smith excavator and loader in digging basement for a building after five stories had already been constructed.

Calculations. Predhumeau-Secrétan Integraph for Earth-Work Calculations (L'intégraphe Predhumeau-Secrétan pour les calculs de terrassements). Génie Civil, vol. 76, no. 5, Jan. 31, 1920, pp. 121-124, 5 figs. Operates on prin-

ciple that slope is constant for each profile. Theory of apparatus is given and application illustrated.

Clay-Digging Machine. Automatic Machine for Excavating Clay (Die Tongewinnung mittels einer Tonstechmachine). Ziegelwelt, vol. 50, no. 80, Oct. 25, 1919, pp. 491-492. Details of construction and operation of a power-driven machine which is said to effect as much as 70 per cent saving in labor in comparison to hand production.

Conduits. Taylorsville Dam Controlling Conduits. Public Works, vol. 48, no. 20, May 29, 192 pp. 464-466, 2 figs. It is stated that earth and rock was excavated to depth of 100 ft. by electric machine with 2½-yd. dragline bucket; sand and gravel for 55,000 yd. concrete were excavated by dragline machine, washed, screened, and stored in gravity plant; concrete was delivered to forms in bottom-dump buckets hauled on flat cars and handled by derricks.

Dragline Installation. Excavating for Ballast in England, R. G. Burdett. Excavating Engr., vol. 14, no. 8, Oct. 1920, pp. 263-265, 5 figs. Description of an unusual dragline installation in England. Mining ballast in 17 ft. of water. Loading into cars on trestle 20 ft. above ground level. Output of ton per minute has been attained.

Electric-Shovel. The Queenstown-Chippewa Hydro-Electric Power Project, Harry Gardner. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 15-19, 14 figs. Operation of electric shovels used for excavation of canal.

Excess-Area Diagram. New Method for Adjusting Earth Excavation and Determining Haul, J. W. Ball and C. R. Shore. Public Roads, U. S. Dept. Agriculture, Bur. Public Roads, vol. 2, nos. 16-17, Aug.-Sept. 1919, pp. 27-34, 14 figs. Illustrates use of "excess area" diagram.

Miami Conservancy District. Moving Earth with Steam Shovel and Hydraulic Giants. Eng. World, vol. 16, no. 5, Mar. 1, 1920, pp. 233-237, 8 figs. Excavation, transportation and deposition of earth used to fill in dams constructed by Miami Conservancy District are said to be accomplished by hydraulic method, described as adaptation of mining methods of Far West.

Recent Practice. Recent Excavator Practice, F. H. Livens and W. Barnes. Eng., vol. 110, no. 2847, July 23, 1920, pp. 110-114, 15 figs. Progress with steam shovel, commonly known as steam navvy. Various machines introduced within last 8 or 10 years are illustrated and described. Paper read before Instn. Mech. Engrs.

Sewers. See SEWER CONSTRUCTION, Excavation Work; TRENCH DIGGING, Steam-Shovel.

Transporting Spoil. Bulk Transportation in Earth Excavation Work, Its Most Expedient Arrangement and Its Influence on the Economy of the Plant (Die Massenbeförderung in Abraumbetrieben, ihre zweckmässigste Einrichtung und ihr Einfluss auf die Wirtschaftlichkeit des Betriebes), L. Herwegen. Braunkohle, vol. 19, nos. 4 and 5, May 8 and 15, 1920, pp. 49-55 and 62-65, 2 figs. Derivations and examples given emphasize importance of proper selection of number of cars and boiler capacity of engine, and accurate calculation as an important factor in life and continuous operation of plant.

Use of Explosives. Experiments Dealing with the Acceleration of Construction of Earthworks, Trenches, etc., by Means of Explosives (Ueber Versuche, betr. die Beschleunigung des Herstellens von Erdarbeiten, Gräben u. dgl. durch Sprengmittel), E. Beckmann and P. Knipping. Gesundheits-Ingenieur, vol. 43, no. 22, May 29, 1920, pp. 253-256, 7 figs. Westfalite, the explosive used for the experiments, contains 95 per cent ammonium nitrate and 5 per cent ground wood and is said to be remarkably free from danger. Use of explosives is said to effect a saving in time and labor.

[See also SHOVELS, Electric; TIME STUDY, Power Shovels.]

EXCAVATION, ROCK

Drag-Line. Rock Excavation with Drag Lines for Miami Conservatory Dams. Eng. & Contracting, vol. 53, no. 3, Jan. 21, 1920, pp. 61-63, 7 figs. Particulars of drag-line work.

EXCAVATORS

Electric Operation. Electrification of Excavating Shovels. Contract Rec., vol. 34, no. 38, Sept. 22, 1920, pp. 898-901. States that motors are now satisfactory for peculiar operating conditions of digging machinery. Outline of types and sizes of shovels and methods of electrification. Gives data of recent tests showing costs per cu. yd., etc., of Hydro-Electric Power Commission. From data arranged by Westinghouse Elec. & Mfg. Co.

Use in Tunneling and Mining. Use of Mechanical Shovelling and Conveying Devices in Tunnel Driving and Mining Operations, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 21, May 20, 1920, pp. 661-666, 9 figs. Details of the Hamilton, the Myers-Whaley, Halby, and Dillig machines, the Westmoreland loader and the Evans scraper loader. Includes diagrams representing shovel motion.

EXECUTIVES

Training of. College Training for Executives, Joseph W. Roe. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 458-461. Writer fixes determining factors for failure or success in engineering as: Character, judgment, efficiency, understanding of men, knowledge of fundamentals, technique. He advises adoption of foundation of mechanical-engineering course in training industrial executives, to which should be added specialized work in shop methods, equipment, industrial organization and management, economics, cost analysis, finance and marketing. Paper read before Soc. of Indus. Engrs.

How to Develop Executive Ability, John H. Van Deventer. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 260-264, 2 figs. Writer holds that executive ability is invariably developed by following, either consciously or unconsciously, a plan of organization which liberates creative effort through establishment of automatic routine. Plan of organization modulated after that of human body is worked out.

Trains Executives in Its Own Plants. Iron Age, vol. 105, no. 13, Mar. 25, 1920, pp. 869-872, 7 figs. It is said that Westinghouse Electric & Mfg. Co., which has conducted its own schools since 1900, finds plan of benefit in development of men.

Women as. The New Place of Women in Industry, Ida M. Tarbell. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 265-266. Economic significance of entrance of women workers in industry. Women as executives.

[See also MANAGEMENT, Statistics, Value of.]

EXHAUST HOODS

See GRINDING MACHINES.

EXHAUST STEAM

Utilization. The Utilisation of Exhaust Steam, Chas. F. Wade. Eng. & Industrial Management, vol. 4, no. 14, Sept. 30, 1920, pp. 424-426, 2 figs. Urges utilization of exhaust steam as means of furthering national fuel economy.

EXPANSION

Isentropic Coefficient. Isentropic Coefficient of Expansion, Satyendra Ray. Physical Rev., vol. 15, no. 1, sec. series, Jan. 1920, pp. 24-29, 2 figs. The square root of ratio of the specific heat to isopiestic coefficient of expansion of a substance has the dimensions of a velocity; ratio of this quantity to velocity of sound in substance is therefore a pure number, value of which is determined by author.

EXPLOSIONS

Coal-Dust. See COAL DUST, Explosions.

Coal-Gas. See GAS EXPLOSIONS, Radiation in.

Coal-Mine. See COAL MINES, Explosions.

Dust. See DUST, Explosions.

Gaseous, Radiation from. See HEAT, Radiation in Gaseous Explosions.

Grain-Dust, Prevention of. Firemen and Prevention of Grain Dust Explosions, David J. Price. Fire & Water Eng., vol. 47, no. 7, Feb. 14, 1920, pp. 379-381 and 400, 4 figs. Examination of reason for dust explosions. It is concluded that special provision should be made in design of mills and elevators to prevent accumulation of dust throughout various parts of plant.

EXPLOSIVES

Blasting. Proper Use of Explosives in Mines, H. Y. Russel. Cement, Mill & Quarry, vol. 15, no. 11, Dec. 5, 1919, pp. 37-40. Explosives discussed are those in which explosive base consists of nitroglycerine, nitroglycerine in combination with guncotton, or nitroglycerine in combination with ammonium nitrate. Paper read before Can. Min. Inst.

Safety Factors in the Use of Explosives in Cement Rock Quarrying, Walter O. Snelling. Cement & Eng. News, vol. 31, no. 12, Dec. 1919, pp. 32-34, 1 fig. Recommendations as to manner of loading and unloading, thawing, etc.

Cement Rock Quarrying. Safety Factors in the Use of Explosives in Cement Rock Quarrying, Dr. Walter O. Snelling. Concrete Age, vol. 32, no. 3, June 1920, pp. 14-18. Methods of handling and using explosives.

Commercial. Modern Commercial Explosives and Their Uses, A. J. Strane. Min. & Metallurgy, no. 163, July 1920, p. 34. States that commercial explosives of today are: Nitroglycerine; blast gelatine; straight nitroglycerine dynamites and straight nitroglycerine gelatines; extra or ammonia dynamites and gelatines; low-freezing explosives; coal-mine powders; miscellaneous explosives, having special advantages for special work; non-freezing or non-nitroglycerine explosives; and black blasting powder. (Abstract.)

Detonation, Strength and Velocity of. Strength and Velocity of Detonation of Various Military Explosives, W. C. Cope. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 870-873. Strength of several explosives, used or proposed for military use is given as compared with TNT, comparison being based on results of ballistic mortar test. Velocity of detonation of several military explosives was determined under known conditions of density and confinement.

Dynamite. An Economic Method of Thawing Dynamite, Douglas Lay. Eng. and Min. Jl., vol. 110, no. 3, July 17, 1920, pp. 106-107, 4 figs. Utilization of heat supplied by lunch room or change house stove provides hot-water coil in thawing house at safe distance. Arrangement eliminates danger from fire hazard and provides economical construction.

Explosion Temperature. Comparison of Values for Explosion Temperatures Obtained from Specific Heats with Those Calculated from Explosive Pressures (Comparaison des températures d'explosion calculées a partir des chaleurs spécifiques et des températures d'explosion calculées à partir des pressions explosives), Henri Muraour. Annales des Mines, vol. 9, no. 2, 1920, pp. 166-180, 1 fig. Graphs are plotted from figures given in tables calculated by various writers and from values determined in experiments with several explosives.

The Temperature of Explosion for Endothermic Substances, Rasik Lal Datta and Nihar Ranjan Chatterjee. Jl. Chem. Soc., vols. 115 and 116, no. 683, Sept. 1919, pp. 1006-1010. Results obtained experimentally for nitro-compounds, picrates azo-compounds, baloid compounds, and organic perchlorates.

Fire Dangers. Fire Dangers of Explosives and Acids, W. S. Topping. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 167-170. Suggestions in regard to handling black powder and gasoline tanks.

Fulminate of Mercury. By-Products in the Manufacture of Fulminate of Mercury (Nebenprodukte bei der Knallquecksilber-Darstellung), H. Langhans. Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 14, nos. 18 and 19, 2nd Sept. and 1st Oct. issues, 1919, pp. 300-304 and 318-321, 2 figs. Notes on condensing liquor or crude ether. Results of investigations are said to show that quantity of distillation product recovered depends upon size, shape and number of condensing chambers connected with one retort, from weather and season of year, suction capacity of exhauster, etc. Notes on chemical reaction of nitrate of silver solution, iodine reaction, and behavior of the liquor in relation to metals.

Handling. Handling of High Explosives in War Time, Godfrey L. Carden. Eng. & Min. Jl., vol. 109, no. 1, Jan. 3, 1920, pp. 17-23, 6 figs. Methods followed at Port of New York from where hundreds of thousands of tons of ammunition worth over $5,000,000 were shipped to Europe.

The Menace of Opening Kegs of Black Blasting Powder with Wooden Tools, S. P. Howell. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2161, Sept. 1920, 3 pp. Details of three accidents in which kegs of black blasting powder exploded instantly when wooden tool was driven forcibly through top of kegs.

High, Manufacture of. The Manufacture and Use of High Explosives, R. Blane. Jl. South African Instn. Engrs., vol. 18, no. 8, Mar. 1920, pp. 128-136, 5 figs. Processes followed at Watford Factory, England, in manufacture of T.N.T. and other high explosives.

Ignition Tests. Ignition Tests of Explosives, W. J. Montgomery. Coal Age, vol. 17, no. 2, Jan. 8, 1920, pp. 43-47, 6 figs. Experiments to determine possibility of explosive being ignited by open-flame lamps in consequence of container completing electric circuit. Results secured are said to substantiate belief that powder or other explosive could be thus detonated.

Land Clearing. Report of Tests to Demonstrate the Adaptability of Grade III TNT for Clearing Land, or Similar Uses, W. J. Montgomery. Professional Memoirs, Corps Engrs. U. S. Army and Engr. Dept. at large, vol. 11, no. 57, May-June 1919, pp. 260-262 and 270-276, 10 figs. Research of Bureau of Mines.

Liquid Air. Liquid-Air Containers (Tauch- und Transportgefässe für flüssige Luft), Eduard Moser. Zeitschrift für angewandte Chemie, vol. 32, no. 94, Nov. 25, 1919, pp. 365-367, 2 figs. Distinction is made between containers for liquid air employed for blasting purposes and consequently only temporarily filled, and containers used for transporting liquid air or for storage of surplus supplies. Writer refers to

popular use of the double-partitioned containers made of different materials according to Weinhold-Dewar principle with evacuated space. Description of porcelain containers which, it is claimed, are now generally used in preference to the original glass and metal containers.

Production and Employment of Liquid Air for Blasting Purposes (Die Erzeugung und Verwendung flüssiger Luft zu Sprengzwecken), H. Diedrichs. Stahl und Eisen, vol. 40, no. 2, Jan. 8, 1920, pp. 52-56, 4 figs. It is pointed out that greater apparent effectiveness of air explosives is because of fact that work can be carried on with greater charge and smaller number of bore holes (about 2:3), resulting in saving in drill work and in use of tools. Air explosives, despite their great explosive power, are said not to have the damaging effect of dynamite.

Utilization of Liquid Air in Mining Operations (L'utilisation de l'air liquide dans l'exploitation des mines), A. Pol. Bulletin et comptes rendus mensuels de la Société de l'Industrie Minerale, vol. 16, no. 4, 1919, pp. 237-260, 7 figs. It is reported that experience of companies has established that while liquid air is not adequate substitute for every explosive used in mining, it surely renders valuable services and is besides inexpensive, and easily employed and practically there is no danger in handling it.

[See also LIQUID AIR, Production of.]

Liquid Oxygen. Data Concerning Use of Liquid Oxygen Explosives in Germany, George S. Rice. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2163, Sept. 1920, 2 pp. Total of 136 plants is mentioned, with total capacity of 3797 liters of liquid oxygen per hour.

Development of Liquid Oxygen Explosives During the War, George S. Rice. Dept. of Interior, Bur. of Mines, technical paper no. 243, 1920, 46 pp., 6 figs. Gives essential results of experiments conducted by Bur. of Mines, observations of liquid explosives of bureau committee sent abroad, and discusses possibilities of applying explosives to mining in United States.

Liquid Oxygen as a Blasting Medium in Mines (Flussiger Sauerstoff als Sprengmittel im Bergbau), Carl Forch. Prometheus, vol. 31, no. 12, Dec. 20, 1919, pp. 91-92. Writer describes production by means of multistage compression of air to pressure of 200 atmos. Method said to be in use in 72 coal mines, 56 ore mines and 32 potash works, producing total of 4885 liters of liquid oxygen per hour.

Liquid Oxygen Explosives, J. Thorburn. Jl. Soc. Chem. Ind., vol. 39, no. 18, Sept. 30, 1920, pp. 317r-318r. States that during war their use spread rapidly in German industry, and under name of "Sprengluft" were extensively used in iron, potash, and non-fiery coal mines, and for tunneling and demolitions both civil and military. Describes preparation of explosive.

Manufacture. Filling Containers with TNT and Amatol. Chem. Age, vol. 1, no. 14, Sept. 20, 1919, pp. 385-386. Methods of filling.

Miedziankit. Experiences with Miedziankit in Quarries (Erfahrungen mit Miedsiankit in Steinbruchbetrieben), C. Küpper. Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 14, no. 18, sec. Sept. issue, 1919, pp. 299-300. Discussion of a substitute chlorate explosive called miedziankit (the Miedsiankit Co., Obernhof), said to explode without shattering action and in consequence to be suited for use in blasting a wide variety of rocks.

Military Tests. Experiments with Blast and Pressure Meters and Tests of Explosives, E. H. Schultz. Professional Memoirs, Corps Engrs. U. S. Army and Engr. Dept. at large, vol. 11, no. 57, May-June 1919, pp. 325-346, 9 figs. Tests made at Aberdeen proving grounds, Maryland.

Nitrocellulose. See NITROCELLULOSE.

Picric Acid. See PICRIC ACID.

Relative Inflammability. Electric Blasting (Note sur le tir electrique). Annales des Mines, vol. 7, 2nd quarterly issue, 1919, pp. 127-261, 11 figs. Classification of various explosives particularly with respect to danger of inflammation.

Research. The Research Department, Woolwich, Robert Robertson. Nature (Lond.), vol. 105, no. 2649, Aug. 5, 1920, pp. 710-712, 3 fig Work done with regard to explosives, particularly TNT.

Safety Device. Removable Auger Bit as a Safety Device. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 739-742, 5 figs. Forcing cartridge into hole too small for it and carrying drills out to blacksmith for reshaping are dangerous. Hard, detachable drill points, used in new types, are said to obviate both risks.

Safety Factors. Safety Factors in the Use of Explosives in Quarrying. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 586-589. Precautions in unloading explosives from cars, selection of materials for building magazines for storage of explosives, advantages and disadvantages of cordeau and electric detonator methods of firing blasts, and precautions in loading blast holes and for making final connections to blast. Paper read before National Safety Congress.

Sensitiveness. Sensitiveness of Explosives to Frictional Impact, S. P. Howell. Dept. Interior, Bur. Mines, technical paper 234, 1919, 17 pp., 3 figs., partly on two supp. plates. Publication includes reference to sensitiveness of explosives, particularly potassium chlorate explosives, to frictional impact; describes Bur. of Mines pendulum friction device and its tests of device; defines salient terms employed, particularly those used in classifying the explosives tested; and discusses results of 370 tests.

Tests. Theoretical Maximum Pressure Developed in Own Volume by Thirteen Military Explosives, J. E. Crawshaw. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 607-625. Results of tests performed at Explosives Experiment Station of Bur. of Mines.

Tetryl. Notes on the Manufacture of Tetryl, D. H. B. Wride. Arms & Explosives, vol. 28, no. 328, Jan. 1, 1920, pp. 6-7. Tetryl, which was used during war as filling for detonators and as primer for high explosive shells, requires, according to writer, extremely careful control during manufacture. He gives account of method of manufacture by using for nitration acid composed of 21 per cent sulphuric and 72 per cent nitric acid and 7 per cent water.

Toluol. See TOLUOL.

TNT. TNT as a Blasting Explosive, Charles E. Munroe and Spencer P. Howell. U. S. Dept. of Agriculture, Dept. Circular no. 94, May 1920, 24 pp., 12 figs. Results of investigations conducted at U. S. Bur. of Mines to discover safest and best ways of utilizing TNT for industrial blasting purposes. Physical and chemical properties of different grades of explosives are given, together with precautions to be observed in handling, packing, preparation of cartridges, and charging, and results of field tests in blasting stumps, rocks and other work are presented and compared with similar results obtained from dynamite.

See also High, Manufacture of; TRINITROTOLUOL.

Trinitroxylene. The Manufacture of Trinitroxylene for Use as a Substitute for TNT in Bursting Charges for High Explosive Shell, John Marshall. Jl. Indus. & Eng. Chem., vol.

12, no. 3, March 1920, pp. 248-250. Report of experiment at Eastern Laboratory, E. I. DuPont de Nemours & Co., Chester, Pa.

Uses in Mining. Use and Abuse of Explosives in Shot Firing, John McNeil. Coal Industry, vol. 3, no. 10, Oct. 1920, pp. 473-475. Describes methods of shotfiring and handling of detonators and powder which have been tried and found efficient in a number of mining operations. Hydraulic pressure is said to be favored. Abstract of paper presented before Rocky Mountain Coal Min. Inst.

EXPORT TRADE

Automobiles. New Zealand Has Potential Market for 25,000 Cars. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 518-519. Report of Bureau of Foreign and Domestic Commerce discussing possibility of American manufacturers continuing to hold automotive trade of New Zealand in competition with British firms. Sales demands and requirements for New Zealand trade are quoted.

Peru as an Automobile Market. Gas Engine, vol. 22, no. 2, Feb. 1920, pp. 65-67. Latin-American Circular No. 62, prepared by Latin-American Division, Bur. of Foreign and Domestic Commerce.

See also AUTOMOBILES, South African Market.

Electrical Goods. The Electrical Market in Italy, O. M. Smart. Elec. World, vol. 74, no. 16, Oct. 18, 1919, pp. 831-833, 1 fig. Writer sees great outlet for exports to Italy, where electrical energy is very generally used in industrial plant. Geographic charts show frequencies and other data are also given.

English as World Language. The English Language and International Trade, Alfred E. Hayes. Jl. Royal Soc. of Arts, vol. 68, no. 3508, Feb. 13, 1920, pp. 198-207 and (discussion) pp. 207-209. German and Bulgarian reviews are quoted as suggesting use of English as international trade language, and it is remarked how personal advantages and intellectual interests have prompted establishment of English-speaking associations in Belgium, Russia and other nations. Impracticability of adopting any artificial tongue is concluded from persistent failure of Volapük, Esperanto, Ido, Pëus, and other world languages.

Iron and Steel. Exporting Iron and Steel—Indirect Selling, V. G. Iden. Iron Trade Rev., vol. 66, no. 21, May 20, 1920, pp. 1474-1477 and 1479, 4 figs. Various methods of approaching foreign markets analyzed. Advantages of direct selling often offset by need of special organization.

Japan. Japan Amends Her Import Tariff, Will Goettling. Trans-Pacific, vol. 3, no. 4, Oct. 1920, pp. 43-48. Anti-dumping and other protection features stand out prominently in new law.

Latin America. Export Customers Point Out Our Export Sales Mistakes, Harry H. Dunn. Automotive Industries, vol. 43, no. 14, Sept. 30, 1920, pp. 674-675. Points out field for truck and tractor manufacturers in Latin American countries.

Trade Opportunities in Latin America, Geo. W. Fishback. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 407-408. Observes that opportunity for trade in Latin-America markets is "knocking insistently at the doors" of our manufacturers, and that there is pressing demand for effort if we are to secure this trade.

Machine Tools. See MACHINE-TOOL INDUSTRY; South American Trade; Spanish Trade; Swedish Trade; MACHINE TOOLS, Export to China; Export to Sweden.

Metric System and. See METRIC SYSTEM, Export Trade and.

Oriental Countries. Opportunity for America in the Orient, Herbert A. Andresen. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, p. 569. Ideas and suggestions based on writer's personal contact with eastern countries. Address delivered before Pittsburgh Advertising Club.

Pacific Countries. Pacific Countries Demand American Machinery, Charles W. Geiger. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 637-644, 9 figs. Survey of rapidly developing industries in various Pacific Coast countries requiring power plant machinery for expansion.

Packing for. Packing for Domestic and Export Shipping, Harry N. Knowlton. Am. Mach., vol. 52, nos. 7 and 16, Feb. 12 and April 15, 1920, pp. 323-326 and 829-832, 3 figs. Feb. 12: Economic aspect of good packing. Apr. 15: Types of packages and methods of handling. Definitions and descriptions of different forms of packages used in shipping goods are given, and method of handling and possibilities of damage to improperly packed commodities are taken up.

Promotion of. Educational Efforts in Foreign Trade and Marine Transportation, Howard A. Barton. Shipping, vol. 9, no. 13, Dec. 31, 1919, pp. 43-45. Work done by Nat. Assn. of Manufacturers for purpose of permitting foreign trade in national sense.

Shipping Quotations, Standardization of. Standardized Practice for American Export Quotations. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 520-522. Rules for standardization of shipping quotations adopted at recent conference of trade organizations.

South America. South America Invites American Rail Construction, John P. Risque. Ry. Age, vol. 69, no. 14, Oct. 1, 1920, pp. 573-574, 1 fig. Suggestion as to lines in Colombia.

Steel. Export Trade's Relation to Steel, E. A. S. Clarke. Iron Trade Rev., vol. 67, no. 13, Sept. 23, 1920, pp. 857-858. Important international commerce of exports of manufacturers is stressed. From pamphlet "Sources of Our Exports" issued by Nat. Foreign Trade Council.

U. S., Position in. Are We Competitive? L. W. Alwyn-Schmidt. Boiler Maker, vol. 20, no. 8, Aug. 1920, pp. 228-230. Position United States holds as competitor in European nations in world's trade.

[See also FOREIGN TRADE.]

EXPOSITIONS

International Machine-Tool. See MACHINE TOOLS, International Exposition.

EXPRESS

See ELECTRIC RAILWAYS, Express Service; MOTOR EXPRESS, Rural.

EXTENSOMETERS

See TESTING MACHINES, Extensometer.

EYE

Contrast Sensibility of. Contrast Sensibility of the Eye. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 366, Mar. 8, 1920, pp. 679-692, 10 figs. Relations between visual angle, contrast, and field brightness for two observers are represented in groups of curves which lie consistently with each other.

F

FABRICS

Elastic. The Manufacture of Elastic Fabrics. India Rubber World, vol. 61, no. 5, Feb. 1, 1920, pp. 286-288, 4 figs. Development of industry and description of looms used, together with other features of weaving.

Water Resistance of. Determination of the Water Resistance of Fabrics, F. P. Veitch and T. D. Jarrell. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 26-30, 2 figs. Modification of funnel test and of spray test, and suggested standardized conditions for performing these tests.

[See also AIRCRAFT CONSTRUCTION MATERIALS, Fabrics.]

FACTORIES

Air Conditioning in. See AIR CONDITIONING, Factories.

Cleaning. Keeping the Factory Clean, H. P. Martin. Factory, vol. 25, no. 4, Aug. 15, 1920, pp. 527-530, 4 figs. It is pointed out that effective janitor service is an aid to safety, fire prevention, and sanitation. Practice of plant is related in which cleaning is done in separate department which carries on work according to specified plans.

See also COMPRESSED AIR, Cleaning, Uses.

Cleanliness in. Encouraging Cleanliness in the Factory. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 49-51, 2 figs. System adopted by Timken-Detroit Axle Co., Detroit, Mich., for promoting cleanliness and efficiency.

Construction. Buildings for Industrial Purposes —Planning the Factory, Arthur F. Wickenden. Eng. and Indus. Management, vol. 4, no. 4. July 22, 1920, pp. 111-112. Description of factory in south of England. Planning of multi-story type buildings.

Design. The Design of the Modern Factory, Ernest G. W. Souster. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 482-484, 2 figs. Discusses problems of layout, pointing out relative merits of the three classes of industrial structures, building of several stories, single-story building, and single-story building with galleries around walls or down center. Notes on construction, elevation, ventilation and heating, lighting, sanitation, etc.

Fire Protection. See FIRE PROTECTION, Factories.

Heating. See HEATING, FACTORY.

Layout. Graphic Representation Reduces Travel in Meter Repair Shop Hundreds of Miles with Consequent Saving in Costs, H. M. Riley. Am. Gas Eng. Jl., vol. III, no. 20, Nov. 15, 1919, pp. 461-468, 7 figs. Diagram studies made preliminary to changing layout of shop.

How to Find the Best Plant Layout, Hasbrouck Haynes. Factory, vol. 24, no. 1, Jan. 1920, pp. 51-53, 4 figs. Illustrates designing of departmental arrangement with help of isometric floor layouts.

Modern Efficiency Features in New Factory. Contract Rec., vol. 33, no. 45, Nov. 5, 1919, pp. 1017-1018, 1 fig. Attention is called to layout which was designed to secure routine of operation.

New Plant of National Acme Company. Iron Age, vol. 104, no. 23, Dec. 4, 1919, pp. 1111-1119, 16 figs. Details of shop built for large production of screw machine products, noting features designed for convenience of employees.

Lighting. See ILLUMINATION, Daylight, Factory; LIGHTING, Factory.

Organization for Mass Production. The Organization of a Factory for Mass Production, H. Schoeberlein-Wattwil. Eng. & Indus. Management, vol. 2, no. 19, Nov. 6, 1919, pp. 594-600, 20 figs. Scientific study of manner of proceeding. Translated from Werkstatts Technik, Switzerland.

Reconstruction, France. Rebuilding a War-Zone Plant, H. Cole Estep. Iron Trade Rev., vol. 66, no. 7, Feb. 12, 1920, pp. 479-488, 15 figs. Writer tells how over $2,000,000 has been spent for reconstruction of International Harvester Co.'s factory near Lille, France. A list is included of new shop tools ordered from United States for plant.

Signaling in. See SIGNALING, Acoustic.

Site Selection. The Design and Construction of Engineering Workshops, Ernest G. Beck. Mech. World, vol. 67, no. 1772, Jan. 2, 1920, pp. 5-7. Suggestions in regard to site selection, and study of relations between design and control.

War-Material, Future Uses of. War Factories and Sheds: Their Construction and Adaptation to Future Needs, Frank Baines. Jl. Roy. Inst. British Architects, vol. 26, no. 11, Sept. 1919, pp. 249-257 and (discussion) pp. 257-259, 5 figs. Particulars relating to factories employed in filling of gas shells and in submarine-mine filling, and illustrations of technical processes which had to be studied before buildings could be planned and adaptations and improvisations which were carried out in response to rapid development of modern warfare. Paper read before Roy. Inst. of British Architects.

[See also MACHINE SHOPS; SHOPS.]

FACTORY MANAGEMENT

See INDUSTRIAL MANAGEMENT.

FANS

See COAL MINES, Fans; GAS WORKS, Water-Gas Plant; GASES, Poisonous.

FANS, CENTRIFUGAL

Blade Inclination. Do Fans Operate by Centrifugal Force? David W. Evans. Coal Age, vol. 18, no. 10, Sept. 2, 1920, pp. 487-489, 3 figs. Tests established that motion of blades creates partial vacuum and therefore that better type of fan is that which protects this vacuum so that only intake air can reach it. Type developed in view of this fact.

Motors for. Motors for Driving Ventilating Fans, William H. Easton. Power, vol. 51, no. 19, May 11, 1920, pp. 759-761, 6 figs. Characteristics of motors for fan drives. Comparisons between alternating-current and direct-current motors. Methods of control and formula for calculating horsepower required to drive fans.

Theory of. The Theory of the Centrifugal Fan, Walter S. Weeks. Min. & Sci. Press, vol. 120, no. 24, June 12, 1920, pp. 858-862, 8 figs. Action is explained particularly in its application to ventilation of mines.

FARM MACHINERY

Darlington Show. The Royal Agricultural Show at Darlington. Eng., vol. 110, nos. 2844, 2845 and 2846, July 2, 9 and 16, 1920, pp. 10-12, 42-46 and 71-73, 39 figs. Plows and tractors exhibited. Description of Blackstone cold-starting oil engine, and of Ricardo engine for agricultural tractor. Machine for making concrete building blocks, and portable power hoists.

The Royal Agricultural Show at Darlington. Engr., vol. 129, no. 3365, June 25, 1920, pp.

650 and 654-655, 6 figs. and vol. 130, nos. 3366-67-68, July 2, 7 and 16, 1920, pp. 8-10, 9 figs., 32-33, 4 figs., and 58-59, 3 figs. Models exhibited.

Electric Operation. Portable Connections of High-Tension Overhead Conductors to Farm Machinery (Les prises de courant aériennes haute tension pour le labourage électrique), Ach. Delamarre. Revue générale de l'Électricité, vol. 7, no. 11, Mar. 13, 1920, pp. 364-368, 6 figs. Connecting arrangement for 15,000-volt line patented by A. Delamarre. Principle upon which safety is provided is that electrical contact is effected by locking mechanism after rod is secured in line, and locking mechanism must be unlocked, thus releasing line, before rod can be removed.

Engines for Driving. Engines for Thrashing Machines and for Farm Power (Maschinen zum Dreschbetrieb und Kraftmaschinen), J. Charbonnier. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 21-22, May 29, 1920, pp. 399-402, 15 figs. Details of locomobiles, crude oil engines, motor for cranking oil engines, etc., of the "Sparhof" Corp., Würzburg.

Manufacture. The Lincoln Works of Messrs. Ruston and Hornsby, Limited. Eng., vol. 110, no. 2845, July 9, 1920, pp. 33-37, 15 figs. partly on 4 supp. plates. Threshing machines, clover hullers, elevators, chaff cutters, rice threshers and other kinds of machinery for dressing seed and grain are manufactured, and in addition agricultural gasoline tractor and bodies for Ruston Hornsby motor car.

The Works of Messrs. Robey and Co., Limited, at Lincoln. Eng., vol. 110, no. 2846, July 16, 1920, pp. 65-71, 27 figs. partly on 4 supp. plates. Farm and mining machinery is manufactured at works.

Motor Plows. See MOTOR PLOWS.

Operating Speeds. The Operating Speeds of Agricultural Implements, Percival White. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 47-50. Opinions of experts are quoted concerning increasing operating speeds of farm machinery, particularly plowing tractor. Majority of them believe that "an acceleration in implement speeds is bound to come, but that its coming will be gradual and slow."

FARMING

Electricity in. See ELECTRIC POWER, Farms, Advantages for; ELECTRICITY SUPPLY, Farms.

Power Farming. Notes on Power Farming, R. W. Lohman. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 160-174 and 185, 36 figs. Paper discusses laying out of a production program, transportation of men and supplies, special implements for raw land preparation, tractor dynamometers, large tractors, special plowing and tilling implements, four-wheel-drive tractors and road haulage.

FATIGUE

Industrial. Industrial Fatigue and Mental Efficiency, B. Muscio. Eng. and Indus. Management, vol. 4, no. 7, Aug. 12, 1920, pp. 206-208. Report presented to Industrial Fatigue Research Board. Tests which form basis of report were mental tests, and they were employed to investigate industrial fatigue caused primarily by continuous demand upon attention.

Industrial Fatigue—Theory and Practice, E. A. Pells. Eng. & Indus. Management, vol. 2, no. 20, Nov. 13, 1919, pp. 618-620, 5 figs. Diagram representing useful work cycle of any operation necessitating expenditure of human energy; also output curves constructed for different gangs of men engaged upon very laborious work, working on piece rate and from starting time to dinner time and then right through to leaving-off time.

Studies in Industrial Physiology: Fatigue in Relation to Working Capacity, Joseph Goldmark, Mary D. Hopkins, Philip Sargant Florence and Frederic S. Lee. Treasury Dept., Public Health Bul. no. 106, Feb. 1920, 213 pp., 40 figs. Comparison of an eight-hour plant and a ten-hour plant. Average output per worker, or group of workers, for each hour of day, is given in figures and tables. Conspicuous feature of eight-hour plant is its steady maintenance of output in contrast to fluctuations of output of ten-hour plant.

Interest in Work and. Interest in Work a Vital Factor in Fatigue Studies, Harry Tipper. Automotive Industries, vol. 42, no. 4, Jan. 22, 1920, pp. 324-325. Emphasizes necessity for taking account of psychological factors in fatigue studies. Writer claims that his experimental studies have shown that fatigue is lessened for increase of interest, even though physical requirements of work may be harder.

Metals. See METALS, Fatigue of.

Prevention of. Fatigue and Industrial Efficiency, Walter N. Polakov. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 448-452, 10 figs. Relations between length of working day, fatigue and efficiency of operation in power houses. Charts are presented showing how fatigue accumulates throughout week and evidence of advantages in regard to output in reducing number of working hours to eight per day is offered.

Prevention of Fatigue in Industry, Reynold A. Spaeth. Indus. Management, vol. 59, nos. 1, 2, 3, 4 and 5, Jan., Feb., March, April and May 1920, pp. 709, 120-122, 215-217, 311-313 and 409-411, 3 figs. Jan.: Need is emphasized to keep fatigue within normal limits, and laboratory tests are declared inadequate. Feb.: Elimination of unnecessary fatigue discussed. Effect of rest periods considered and conclusion drawn that although production may not be increased by recesses in working day, influence of rests is beneficial. Mar.: It is advised to analyze physical, physiological and psychological requirements of various processes and establish standards for each job. Apr.: Results of Psychological tests made with girls engaged in gaging and inspecting shells for rifle cartridges. May: Limitations of methods of scientific management discussed. Claim made that loyalty and fairness will get results in production.

The Promotion of Industrial Efficiency. South African Jl. Industries, vol. 3, no. 1, Jan. 1920, pp. 56-68. Discusses influence, upon efficiency and output, of hours of labor, rest pauses and holidays. From Bulletin issued by Advisory Council of Science and Industry of Australia.

Unnecessary Fatigue—The Immense Loss It Causes to the State, Frank B. Gilbreth, Lillian M. Gilbreth. Eng. & Indus. Management, vol. 3, no. 2, Jan. 8, 1920, pp. 50-52. Attention is directed to painting factory interiors with a view to diminishing eye strain, providing chairs for permitting workers to sit during periods of unavoidable delay in standing operations, etc.

Reduction of. Unnecessary Fatigue, Frank B. Gilbreth and Lillian M. Gilbreth. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 154-156, 7 figs. Recommends making regular fatigue surveys and points out ways of reducing unnecessary fatigue.

Rest-Day Provision. A Rest Day in Continuous Operation Industry, Fred C. Croxton. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 118-127, 3 figs. Three plans are submitted which cover six working positions. The one suggested as simplest provides for full 24-hour rest after six consecutive turns.

FATS

Catalytic Reduction of. Investigation of the Catalytic Reduction of Fats with Palladium (Untersuchungen über die katalytische Reduktion von Fetten mit Palladium), F. F. Nord. Zeitschrift für angewandte Chemie, vol. 32, no. 78, Sept. 30, 1919, pp. 305-309. Results of experiments with various oils are presented. Article prepared in 1913 but publication delayed because of war.

Hydrogenation of. See NITRIC ACID, Manufacture.

FATTY ACIDS

See ACIDS, Fatty.

FEDERATED AMERICAN ENGINEERING SOCIETIES

See ENGINEERING SOCIETIES, Federated American Engineering Societies.

FEEDWATER HEATERS

Types. A Series of Articles on Power Plant Management, Robert June. Power House, vol. 13, no. 12, June 21, 1920, pp. 289-291, 4 figs. Deals with boiler feedwater heaters, merits of open and closed types being compared. Details and illustrations are given of the Cochrane and National open feed water heaters, the Hoppes horizontal and the Wainwright closed heater.

FEMALE LABOR

See WOMEN WORKERS.

FERMENTATION

See YEAST, Action of.

FERMENTS

Catalyzing Properties. Ferments and Catalyzers, Paul Sabatier. Sci. Am. Supp., vol. 88, no. 2285, Nov. 8, 1919, pp. 274-275 and 278-279. While admitting that science is almost entirely ignorant of constitution of diastases produced by living ferments, writer asserts that it is permissible to believe, at least in case of some of them, that their catalyzing property has direct relation with that of certain very simple mineral catalyzers which enter into their composition.

FERRIC HYDRATE

See COAL MINES, Ferric Hydrate from Mine Water.

FERRIES

Automobile. A Double Decked Automobile Ferry with a Winton Diesel Electric Drive, Renwick Z. Dickie. Pac. Mar. Rev., vol. 17, no. 2, Feb. 1920, pp. 103-105, 3 figs. Also in Int. Mar. Eng., vol. 25, no. 7, July 1920, pp. 556-558, 2 figs. Boat is 205 ft. overall, 44 ft. beam, with breadth over guards of 68½ ft. To be driven by two 500-hp. stationary non-reversible Diesel engines of eight-cylinder type direct-connected to generator which will feed large driving motor direct-connected on paddlewheel shaft.

FERROALLOYS

Carbon Determination. Carbon Determination in Ferro-Alloys, C. J. Rottmann. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 5, pp. 59-68, 4 figs. Describes potash bulb which is said to permit determination of carbon content of ferroalloys to 0.002 per cent; also nichrome-wound furnace for combustion.

Electric-Furnace Manufacture. Electric Practice in Making Ferroalloys, W. A. Darrah. Iron Age, vol. 105, nos. 15 and 17, Apr. 8 and 22, 1920, pp. 1019-1021 and 1170. American electric ferromanganese is compared with the blast-furnace product. Notes on losses and power consumption, and commercial conditions. Raw materials and operating practice for ferrosilicon.

Manufacture of Electric Ferroalloys, C. B. Gibson. Iron Age, vol. 105, no. 16, Apr. 15, 1920, pp. 1102-1103. Notes on factors affecting success, design of furnace for various alloys, power consumption, and recent improved devices.

Manufacturing of Ferro-Alloys in the Electric Furnace (La fabrication des ferro-alliages au four électrique), M. Keeney. Revue de Métallurgie, vol. 16, no. 4, July-Aug. 1919, pp. 269-310. Metallurgical aspect. Reference is made to English practice.

Recent Developments in the Ferro-Alloy Industry, Robert J. Anderson. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 13, pp. 177-206. Discussion of conditions in industry, with special reference to relations of industry in the United States to that in foreign countries. It is stated that "the electric furnace has made the growth of the industry possible" and that "further development and use of alloy steels is certain to continue and at the same time increase the normal demand for all kinds of ferroalloys."

The Manufacture of Ferro-Alloys in the Electric Furnace, C. B. Gibson. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 17, pp. 265-273. Notes on design of electric furnaces for producing alloys, with data on power consumption and raw materials handled per kw.-year, published by various experimenters.

Ferrocerium. See FERROCERIUM.

Ferrochrome. See FERROSILICON, Electric-Furnace Manufacture.

Ferromanganese. See FERROMANGANESE.

Ferrosilicon. See FERROSILICON.

Ferrotitanium. See TITANIUM, Uses.

Ferrotungsten. See FERROTUNGSTEN.

Ferrovanadium. See FERROVANADIUM.

Manufacture. Complex Ferro-Alloys (Les ferro-alliages complexes). Journal du Four Electrique, vol. 28, no. 22, Nov. 15, 1919, pp. 149-151. Manufacture, properties and uses of ferro-silico-aluminum, ferro-silico-manganese, ferro-silico-nickel, ferro-mangano-nickel and ferro-chromos-aluminum.

Market in 1919. Ferroalloy Year in Three Phases. Iron Trade Rev., vol. 66, no. 1, Jan. 1, 1920, pp. 107-109. Period of liquidation is said to have been followed by one of competition, bringing stage where demand exceeded supply.

Production. See FERROMANGANESE, Production.

Progress in 1919. The Ferro-Alloy Industry in 1919, R. J. Anderson. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 204-208. Among developments noted are practice of molten ferromanganese and spiegeleisen and the stimulation of demand for chromium and ferrochromium in consequence of motorcar industry getting into production on peace basis.

Properties. Variations of Magnetic Properties, Resistivity and Density of Ferroalloys with Their Chemical Composition and Thermal Treatment (Variations des propriétés magnétiques, de la résistivité et de la densité des alliages de fer avec leur composition chemique et leur traitement thermique), E. Gumlich. Revue générale de l'Électricité, vol. 7, no. 18, May 1, 1920, pp. 581-588, 10 figs. Researches undertaken at laboratory of technical university of Aix-la-Chapelle and at various foundries. Studies were made with electrolytic iron, ferrocarbon, ferrosilicon, ferroaluminum and ferromanganese. Translated from Electrotechnische Zeitschrift, vol. 40, June 26, July 3, 10, 17 and

24, 1919, pp. 312-324, 334, 350 and 361, 21 figs.

Silicon. Limit of Combination of Silicon with Some Metals of Iron Family (Sur la limite de combinaison du silicium avec quelques métaux de la famille du fer), A. Sanfourche. Revue de Métallurgie, vol. 16, no. 4, July-Aug. 1919, pp. 239-245. Experimental. It was found that richest combinations manifest tendency to partial dissociation until equilibrium was established according to general equation $M_x Si_y = M_x Si_{g-z} + Si_z$.

[See also ELECTRIC FURNACES, Uses.]

FERROCERIUM

Properties. Ferrocerium, Alcan Hirch. Gen. Meeting of Am. Electrochemical Soc., Apr. 9, 1920, paper no. 44, pp. 711-714. Manufacture and properties.

Use as a Deoxidizer. New Ferroalloy for Deoxidizing Molten Iron. Iron Age, vol. 195, no. 5, Jan. 29, 1920, pp. 324-325. Analyses of ferrocerium showed this alloy possesses low melting point and marked affinity for oxygen. Paper read before Am. Foundrymen's Assn.

FERROCHROME

See FERROSILICON, Electric-Furnace Manufacture.

FERROMANGANESE

Electric. Electric Ferromanganese. Iron Age, vol. 106, no. 9, Aug. 26, 1920, p. 549. Process used by Bilrowe Alloys Co. in Washington employing Montana manganese ores.

See also FERROALLOYS, Electric-Furnace Manufacture.

Industry. Manganese, C. M. Weld. Dept. of Interior, Bur. of Mines, bul. 173, 1920, 209 pp., 13 figs. Uses, preparation, mining costs and production of ferromanganese.

Manufacture in Great Britain. Ferromanganese Practice in Great Britain, Paul M. Tyler. Iron Age, vol. 106, no. 12, Sept. 16, 1920, pp. 711-713. Unusual feature of one furnace design is contraction from bosh and hearth which instead of being straight line, comes down on curve of 26 ft. radius.

Production. Manganese and Allied Ferro Alloy Production. Raw Material, vol. 2, no. 1, Jan. 1920, pp. 482-486, 3 figs. Rapidly increasing prices for ferromanganese are contributed to shortage of these ores in America in consequence of a shrinkage of Russian exports, monopoly of British India ores by English interests and greatly increased export taxes on Brazilian ore.

FERROSILICON

Acid-Resisting Properties. Resistance of Ferrosilicons to Acids (La résistance aux acides de divers ferrosiliciums). Génie Civil, vol. 76, no. 8, Feb. 21, 1920, pp. 214-215. Compositions of various alloys are given, together with results of experiments in which their resistances to various acids were compared. From Chimie et Industrie.

Electric-Furnace Manufacture. Builds Electric Ferroalloy Plant. Iron Trade Rev., vol. 66, no. 10, Mar. 4, 1920, pp. 706-707, 4 figs. Plant of United States Ferro Alloys Corp., Niagara Falls, N. Y. Principal products are ferrosilicon and ferrochrome.

Electric Furnace Manufacture of Ferro-Silicon, Thomas Robson Hay. Raw Material, vol. 1, no. 8, Nov. 1919, pp. 396-400, 5 figs. Construction and operation of furnace.

Fusion Diagram. Contribution to the Study of Ferrosilicon (Contribution a l'etude des ferrosiliciums), M. A. Sanfourche. Revue de Metallurgie, vol. 16, no. 3, May-June 1919, pp. 217-224, 2 figs. Also in Foundry Trades Jl., vol. 22, no. 217, Jan. 1920, pp. 46-47, 2 figs. Fusion diagram of iron-silicon alloys, constructed from results of experiments.

Properties and Uses. Industrial Ferrosilicons (Les ferrosiliciums industriels), J. Hebert. Technique Moderne, vol. 12, no. 5, May 1920, pp. 193-199, 18 figs. Manufacturing properties and uses.

Properties of Ferrosilicon, F. A. Raven. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 37, pp. 577-588, 7 figs. Various grades of commercial ferrosilicon are described and their metallography and physical properties discussed. Their production by reduction by carbon in blast furnace is described and also their production in electric furnace. Writer declares that furnaces with high-frequency current (60 cycles), will work just as efficiently and satisfactorily as low-frequency furnaces (25 cycles), if properly designed and operated.

[See also FERROALLOYS, Electric-Furnace Manufacture.]

FERROTITANIUM

See TITANIUM, Uses.

FERROTUNGSTEN

Tungsten Content of. The Determination of Tungsten in Ferrotungsten (Zur Wolframbestimmung in Ferrowolfram), Ludwig Lövy. Zeitschrift für angewandte Chemie, vol. 32, no. 100, Dec. 16, 1919, pp. 379-380. Details and results of experiments carried out at the laboratory of the Mannesmann Works in Saarbrücken.

FERROVANADIUM

Metallurgy of. Development of Ferro-Vanadium Metallurgy, B. D. Saklatwalla. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 42, pp. 689-700. General review is given of occurrence of vanadium in nature, its discovery and its restricted utilization as rare and expensive element. Details are included of its modern introduction into large scale metallurgical practice in armor plate and special steels, and of reduction of its compounds to metal by silicon in electric furnace. Aluminothermic reduction as practiced on a large scale in the United States is explained.

FERTILIZERS

Analyses of. Fertilizer Report, James W. Kellogg. Bul. Pa. Dept. Agriculture, Harrisburg, Pa., vol. 2, no. 9, Aug. 1919, 69 pp. Report of determinations made of 548 different fertilizers in regard to moisture, nitrogen, total, available and insoluble phosphoric acid and water-soluble potash.

Commercial. Commercial Fertilizer, Thomas R. Harney. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 412-416, 7 figs. Discussion of its functions and exposition of methods used in its manufacture. From Nature, Lond.

Data on Industry. A Survey of the Fertilizer Industry, E. A. Goldenweiser. Am. Fertilizer, vol. 52, no. 1, Jan. 3, 1920, pp. 53-68. Data on phosphate rock, tankage producers, etc., compiled by Bur. of Soils.

Furnace Waste Gases as. Utilizing Furnace Waste Gases for Carbonic Acid Fertilizer (Die Ausnützung der Hochofenabgase zur Kohlensäuredüngung), Friedrich Riedel. Stahl und Eisen, vol. 39, no. 49, Dec. 4, 1919, pp. 1497-1506, 10 figs. Tests conducted in hothouses and open fields are said to have shown yield of soils treated with these gases to be two to three times higher than that of untreated soils.

See also BLAST-FURNACE GAS, Use as Fertilizer.

Kahlkalk. A New Fertilizer. Am. Fertilizer, vol.

52, no. 2, Jan. 17, 1920, p. 59. Swedish fertilizer. "Kahlkalk," with potash base made by mixing ground feldspar, limestone and gypsum and calcining mixture in furnace at temperature of 1150 deg. cent.

Manufacture. Utilization of Lignites and Manufacture of Nitrogenous Fertilizers in Spain (El aprovechamiento de los lignitos y la fabricación de abonos nitrogenados en Espana), Rodrigo de Rodrigo y Jiminez. Revista Minera, vol. 70, no. 2716, Dec. 16, 1919, pp. 617-619. Paper read before Spanish Nat. Congress of Eng.

Nitrogen. See CYANAMID, Refining.

Peat for. Value of Minnesota Peat, Henry H. Hindshaw. Jl. Am. Peat Soc., vol. 12, no. 4, Oct. 1919, pp. 194-198. As fertilizer element.

Sulphite Brine. Sulphite Brine as Fertilizer (Nochmals über Sulfitlauge als Dungemittel), Th. Bokorny. Chemiker-Zeitung, vol. 44, no. 25, Feb. 26, 1920, p. 174. Includes data on composition of sulphite brine before and after de-sugaring and tells of successful use of de-sugarized sulphite brine as fertilizer.

Tendency of Industry. The Fertilizer Situation, Milton Whitney. Chem. and Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1021-1023. Tendency of industry.

Tetraphosphate. Tetraphosphate—A Special Italian Fertilizer. Am. Fertilizer, vol. 51, no. 11, Nov. 22, 1919, pp. 58-59. Phosphorite is ground finely and mixed with 6 per cent of powder made up principally of oblomite, sulphate of sodium and carbonate of sodium, and is then heated in furnace to about 700 deg. cent.; finally, while still hot, mass is hydrated with fine spray of water so as to add about 8 kg. of water per quintal.

FIBER CONTAINERS

See RESEARCH, Fiber Container Industry.

FIELD GLASSES

Monocular vs. Binocular. The Relative Merits of Monocular and Binocular Field-Glasses. Jl. Franklin Inst., vol. 189, no. 3, Mar. 1920, pp. 331-369, 14 figs. Results of investigation undertaken by sub-committee of National Research Council. In daylight under various conditions 7174 experiments were conducted with binocular glasses and simultaneously equal number with optically identical monoculars. Test objects were detected in 5047 cases with binoculars and in 4726 with monoculars.

Tests. Relative Merits of Field-Glasses. Jl. Franklin Inst., vol. 189, no. 2, Feb. 1920, pp. 205-223, 9 figs. Non-stereoscopic acuity tests under twilight illumination.

FILES

Manufacture. Do You Believe that the File is a Fine Tool? J. H. Moore. Can. Machy., vol. 21, no. 17, Oct. 30, 1919, pp. 427-432, 11 figs. How Ingersoll files are made.

Microscopic Structure. The Microscopic Structure of Files and Chip-Forming Tools in General (Mikroskopische Struktur der Feile und spanbildende Werkzeuge im allgemeinen), W. Scheffer. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 42, no. 51, Dec. 19, 1919, pp. 393-394, 9 figs. Photomicrographs.

FILING SYSTEMS

Bureau of Mines. Some Thoughts on Filing Systems, Donald J. Baker. Coal Age, vol. 16, no. 19, Nov. 6, 1919, pp. 736-740, 7 figs. System employed at Bur. of Mines Station in Pittsburgh.

FILTER PRESSES

Construction and Use. Recessed Plate and Plate and Frame Filter-Presses: Their Construction and Use, Eustace A. Alliott. Jl. Soc. Chem. Industry, vol. 39, no. 16, Aug. 31, 1920, pp. 261T-285T, 45 figs. Structural characteristics of various types, and records of their operation.

FILTERS

Baffles for. Notes on the Results of Experimental Baffles at Montebello Filters, James W. Armstrong. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 456-460, 2 figs. Comparison of efficiency of two different basins.

Bell-Shaped. Bell-Shaped Filters (Glocken-Filter), Reinhold Mestel. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 10, Mar. 6, 1920, pp. 158-159, 2 figs. Describes new patented type of artesian well filter, the inlet openings of which are horizontal, and in which the water is prevented from falling directly into well.

Cleaning. Scientific Control of the Filter Station, Arthur Wright. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1119-1122, 2 figs. Discussion on washing and drying filter cakes, and blowing with air or steam to displace filtrate, wash liquor and water.

Cleaning Sand. Method of Cleaning Filter Sand at Chain of Rocks Filtration Plant. Eng. and Contracting, vol. 54, no. 10, Sept. 8, 1920, pp. 228-229, 4 figs. Sand is cleaned by two water jets, one being placed in each half of filter bed on top of sand and discharging into opposite half of bed or to opposite end of same half of bed, into wooden box containing series of sloping screens. Water at about 100 lb. pressure is used in jets.

Continuous. Continuous Filtering Drums (Les tambours filtrants continus), Léonce Fabre. Génie Civil, vol. 76, no. 24, June 12, 1920, pp. 525-528, 10 figs. Description of Zenith filter.

Moore. Vacuum and Compressed Air for Industrial Filtration (L'emploi du vide et de l'air comprimé pour la filtration), Léonce Fabre. Génie Civil, vol. 76, no. 18, May 1, 1920, pp. 405-409, 15 figs. Moore immersion and suction filters.

Plates and Frames. A Classification of Filter Plates and Frames and Their General Usage, D. R. Sperry. Chem. & Metallurgical Eng., vol. 22, no. 11, Mar. 17, 1920, pp. 493-496, 10 figs. Flush or recessed types with port or cock outlet sub-types are illustrated and also plain, simple or thorough washing arrangements with or without separate outlets for wash subarrangements.

FILTERS, SAND

Drifting. Sandwashers of the Drifting Sand Filters, William Gore. Contract Rec., vol. 34, no. 24, June 16, 1920, pp. 574-576, 2 figs.; also Can. Engr., vol. 38, no. 25, June 17, 1920, pp. 563-566, 5 figs. Success of this system of water filtration is said to depend on efficient working of continuously operated sandwashers; erosion of metal parts is chief difficulty and therefore new types have been evolved to overcome this trouble, which are described.

The Toronto Drifting Sand Water Purification Plant, William Gore, William Storrie. Jl. Eng. Inst. of Canada, vol. 2, no. 11, Nov. 1919, pp. 701-713, 17 figs. Details of construction and characteristic curves of sandlifting.

The Toronto Drifting Sand Filters. Mun. Jl. & Public Works, vol. 47, no. 15, Oct. 11, 1919, pp. 220-222, 5 figs. Noting difficulties caused by variations in turbidity.

Hartford, Conn. Building the Hartford Filter. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 159-162, 4 figs. Describes methods and plant used by contractor in building slow-sand filter covering five acres and roofed over. It is related that concrete was distributed entirely by spouting and collapsible roof forms were used eight times.

Purifying Capacity. The Laws of Absorption as Related to the Purifying Capacity of the Sand Filter (Die Bedeutung der Absorptionsgesetze für das Reinigungsvermögen der Sandfilter), H. Zunker. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 25, June 19, 1920, pp. 404-405. Suggests as precautionary measures against infection of purified water: Covering of filter plants in order to obtain more uniform water temperature; from the daily measurement of raw water temperatures, periods should be ascertained when a dangerous enrichment of the purified water with bacteria is to be expected, namely, the periods of rapidly rising water temperature; the raw water should have sufficient content of organic substances, etc.

Surface Shrinkage. The Surface Shrinkage of Rapid Filter Sand Beds, Abel Wolman and Sheppard T. Powell. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 210-216, 3 figs. Discussion of causes and importance of varying degree of adsorptive power of sand grains. Application of colloid chemistry concepts to sanitary engineering problem.

The Surface Shrinkage of Rapid Filter Sand Beds, Robert Spurr Weston, J. W. Ellms, Allen Hazen and Cornelius M. Daily. Eng. News-Rec., vol. 85, no. 10, Sept. 2, 1920, pp. 438-441, 1 fig. Opinions on article by Abel Wolman and Sheppard T. Powell in Eng. News-Rec., July 29, 1920. Two engineers think shrinkage away from filter walls due to horizontal pressure. One believes it a matter of physics rather than physical chemistry. Fourth gives more credence to colloidal theory.

Toronto. See Drifting.

FILTRATION

Centrifugal. A New Process of Centrifugal Filtration, W. J. Gee. Jl. Soc. Chem. Industry, vol. 39, no. 15, Aug. 16, 1920, pp. 255T-256T, 1 fig. Apparatus combining centrifugal separation with filtration through non-choking filter.

Commercial. Commercial Filtration, J. E. Springer. Color Trade Jl., vol. 6, no. 3, Mar. 1920, pp. 73-76, 3 figs. Notes on disk filter, long-leaf pressure type of filter and method of operating it, and cleaning of filter cloths.

Data on. Conference on Filtration. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 226T-233T, 3 figs. Following papers are given in abstract form: The Principles of Technical Filtration, Emil Hatschek; The Filtration of Colloids, W. R. Ormandy; The "Sturgeon" Self-Discharging Centrifuges for Separating Solids from Liquids, R. A. Sturgeon; The Sharples "Super-Centrifuge," S. H. Menzies; Design of Mechanical Filters, Balfour Bramwell.

Filtrate Classification. Scientific Control of the Filter Station, Arthur Wright. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1015-1017. Discussion on clarification of filtrate. Use of lighter filter cloths made of open woven fabrics advocated. Method of application and use of filter-aids.

Gans Apparatus. Gans Apparatus for Ultrafiltration (Aparato de ultrafiltración según Gans), Leonor Sarlo Villegas. Contribución al Estucio de las Ciencias físicas y matemáticas, Universidad nacional de la Plata, vol. 2, no. 43, Sept. 1919, pp. 415-418, 2 figs. Membrane impregnated with glacial acetic acid is used as filter.

Industrial. Industrial Filtration, Henry B. Faber. Jl. Soc. Chem. Industry, vol. 39, no. 3, Feb. 16, 1920, pp. 21T-22T. Process invented by George Moore. Involves use of filter leaves operating in open tank.

Scientific Control of the Filter Station, Arthur Wright. Chem. & Metallurgical Eng., vol. 22, no. 25, June 23, 1920, pp. 1165-1167, 7 figs. Methods in discharging filter cake from presses.

Press Operation. Scientific Control of the Filter Station—V, Arthur Wright. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920. General discussion and summary of features on filter press operation. Types of presses and their application. Materials used in construction of presses, pressure devices, scope of centrifuging, decantation and flotation.

Problems. Filtration and Filters, Henry B. Faber. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 17-19. Filtering problems are classified into three groups: Those in which slurries contain fine suspensions not of colloidal character; those where slurries contain relatively free filtering suspensions; and large crystals. Types of filters adapted for each of these groups are pointed out.

FILTRATION PLANTS

Cleaning Filters. Water Jets and Sand Blast Clean St. Louis Filters, C. M. Daily. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1198-1200, 4 figs. Jets set in beds for five hours cut coating from sand grains and break up mud balls. Blast opens strainer holes.

Concrete Mechanical Type. Modern Filter Plant of New Chester Water Company, Isaac S. Walker. Fire and Water Eng., vol. 68, no. 8, Aug. 25, 1920, pp. 387-389, 2 figs. Plant is of concrete mechanical type, and consists of a two-compartment sedimentation basin, 10 rectangular filter units superimposed above a clear water basin, and a low lift pumping plant.

Control Standards and Tests. Bacteriological Tests and Standards in Filter Plant Control, Milton F. Stein. Eng. & Contracting, vol. 53, no. 15, Apr. 14, 1920, pp. 424-426, 3 figs. Notes on limitations and improvements of filter plant laboratories; cost of too severe standards in additional alum used; bacterial count and interpretation; bacterial removal or filter efficiency on sliding scale; proper enumeration of fermentation test results; correlation of fermentation tests and bacterial count; and why treasury department standard is not suitable for filter plants. Abstract of paper read before Illinois section of Am. Waterworks Assn.

Elmira, N. Y., Operation. The Operation of an American or Rapid Water Filtration Plant for Twenty Years at Elmira, New York, James M. Cairo. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 409-421. Elmira has population of about 45,000. Greater part of city's water supply is obtained from Chemung River. At Elmira water for filtration is taken from river through cribs connected with gallery from which it flows by gravity to pumps.

England. Rapid Filtration Plant at Birmingham. Eng., vol. 129, no. 3364, June 18, 1920, pp. 622-624, 6 figs. Plant purifies per day 3,000,000 gal. of water pumped from river Blyth as emergency supply.

FINITENESS

Theorems of. On a New Treatment of Theorems of Finiteness, Oliver Edmunds Glenn. Trans. Am. Math. Soc., vol. 20, no. 3, July 1919, pp. 203-212. Determination of complete system of concomitants in domain R (1 T, O) of binary quintic carrying with it as special case complete system of orthogonal concomitants of quintic form.

FIR

Douglas. Inclined-Bearing Tests on Douglas Fir and White Pine, Thomas R. Simpson. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 654-655, 4 figs. Results of tests are plotted together with terminal values as computed from Jacoby and Howe formulæ. It was found in

investigations that loads for 0.03-in. indentation correspond closely with Howe curve.

FIRE HAZARDS

Dry-Cell Batteries. Fire Hazard of Dry Cell Batteries, H. L. Miner. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 148-150, 1 fig. Due to their becoming short-circuited.

FIRE HOSE

Action of Water Upon. The Action of Water Upon Hose Linings and the Acid Corrosion of Jackets and Couplings, L. B. Buchanan. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 263-268. Tests are said to have demonstrated that practically all hose is liable to generate sulphuric acid if left wet inside for any considerable length of time in a warm room, weak acid so generated being capable of concentration to a strength sufficient to destroy fabric and corrode couplings.

FIRE HYDRANTS

See HYDRANTS.

FIRE PREVENTION

Coal Mines. See COAL MINES, Fire Prevention in.

Coal-Tar Chemical Works. Prevention of Fires and Explosions in Coal-Tar Chemical Works, Nicholas Richardson. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, pp. 273-274. Report submitted by Underwriters' Bureau of New England to Atlantic Dyestuff Co., Boston.

Dust Explosions. The Prevention of Dust Explosions. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 926-928, 4 figs. Instances of dust explosions are quoted, nature of dust explosions is investigated and rules for preventing them are formulated.

English Practice. Fire Prevention and Protection as Exemplified in an English Factory, Stanley W. Thorpe. "Red Books" of the British Fire Prevention Committee, no. 236, 1919, 44 pp., 45 figs.

Fire Stopping. Fire Stopping is Too Often Neglected. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 929-930, 5 figs. Methods of fire stopping recommended by National Lumber Manufacturers' Assn.

Mines. See MINES, Fire Prevention.

Steel Plants. See STEEL PLANTS, Fire Prevention.

Upkeep of Fire Apparatus. Keeping Fire Apparatus Efficient, Herbert T. Wade. Sci. Am. Supp., vol. 88, no. 2292, Dec. 27, 1919, pp. 380-381, 6 figs. Repair, manufacturing and test work of New York Fire Dept. repair shops.

[See also GLASS, Wired, as Fire Retardent.]

FIRE PROTECTION

Aeroplanes. See AEROPLANES, Fire Protection.

Building Construction and. Building Construction and Fire Protection, J. Grove Smith. Contract Rec., vol. 33, no. 45, Nov. 5, 1919, pp. 1022-1025. From report on fire waste in Canada of Dominion Fire Commissioner.

Car-Storage Yards. Chemical Fire Protection for the Car-Storage Yard. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 753-754. Installation of Chicago Elevated which comprises ten cars with chemical apparatus including two 100-gal. operating tanks and a 500-gal. auxiliary supply tank particularly for use to extinguish fires where water mains are not available.

Factories. Factory Fire Protection, Benjamin Richards. Jl. Western Soc. Engrs., vol. 25, no. 7, Apr. 5, 1920, pp. 221-233 and (discussion) pp. 233-237. Writer points out that protection against loss by fire may be roughly divided into three main branches—indemnity against loss, mean of protection against loss in providing fire-extinguishing apparatus, and fire prevention, and discusses each of these points.

Fireproof Doors and Windows. Giving the Factory Better Protection, J. A. Findlay. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 938-940, 4 figs. Types of fireproof windows and doors.

Maintenance of Systems. Care and Maintenance of Fire-Protection Systems, C. H. Jenkins. Power, vol. 52, nos. 4 and 5, July 27 and Aug. 10, 1920, pp. 124-127, 1 fig., and 213-216, 4 figs. Suggestions in regard to testing new system and conducting weekly inspections of sprinkler systems.

Marine Terminals. See TERMINALS, MARINE, Fire Protection.

Private. Report of Committee on Private Fire Protection Service. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 679-770 and (discussion) pp. 770-784, 12 figs. Concerning manner of controlling fire service pipes where they enter buildings of private property, limit to be placed upon size of fire-service connections, means to prevent pollution of public water supply through private fire-protection service, and advisability of making charge for private fire-protection service and manner of determining this charge.

Railway, Equipment for. Railway Fire Protection Equipment, C. R. Knowles. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 645-648, 2 figs. Agents in use on railway are enumerated to be: Bicarbonate of soda, caustic soda and sulphuric acid, carbon-tetrachloride, dry sand and water. Paper read before Am. Ry. Bridge & Building Assn. Also in Ry. Maintenance Engr., vol. 15, no. 11, Nov. 1919, pp. 404-407, 5 figs.

Safety and. Industrial Safety, Sidney J. Williams. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1070-1071. Fire protection in relation to safety. Paper read before Schools for Safety Engrs.

Sprinklers. Unsatisfactory or Serious Fires in Buildings Equipped with Sprinklers. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 293-299. Examples are quoted of fires in buildings equipped with sprinklers and reasons are indicated why sprinklers failed to operate satisfactorily.

Static Electricity. Elimination of Danger of Fire from Electrically Excited Inflammable Liquids (Ueber die Beseitigung der Brandgefahren bei elektrisch durch Strömen erregten feuergefährlichen Flüssigkeiten), H. Holde. Feuerwehrtechnische Zeitschrift, vol. 8, nos. 9-10, May 5-20, 1920, pp. 73-77, 2 figs. Experiments and theoretical studies show that the grounding of all metallic pipes and containers, such as tanks and other reservoirs, which come in contact with electrically excited liquids, is entirely adequate for preventing ignition.

Water Supply for. See WATER SUPPLY, Co-operative Fire-Protection Scheme.

[See also BUILDINGS, Fire Hazards; COAL MINES, Fire Prevention; FIRE PREVENTION; FIRE WALLS; GAS MASKS; PAPER MILLS, Hazards in.]

FIRE PUMPS

See PUMPS, Fire.

FIRE WALLS

Defects in. More Little Journeys in Fire Protection: Fire Walls, Charles E. Worthington. Safety Eng., vol. 38, no. 5, Nov. 1919, pp.

263-272, 15 figs. Illustrates various defects in fire-wall construction.

FIREBOXES

Copper for. See COPPER, Firebox, Standardization of.

FIREBRICK

Furnace for Testing. Furnace for Testing Firebrick Under Load at High Temperatures, C. H. Lovejoy. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 109-110, 3 figs. Apparatus consists essentially of firebrick chamber in which test brick is heated while pressure is applied at ends.

Laying. The Use of Fire Clay in Laying Fire Clay Brick, Raymond M. Howe. Clay Worker, vol. 73, no. 2, Feb. 1920, pp. 136-138, 7 figs. Writer lays emphasis on harmful results which may follow addition of certain foreign materials to ground fireclay and good results which may be obtained by addition of ground bats.

Mortar for. Analyzing Mortar for Firebrick, Raymond M. Howe. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 593-595, 6 figs. It is stated that adding foreign materials to mortar used in laying firebrick frequently reduces refractoriness of lining. Tests showed ground brick and clay make effective mixture.

Porosity and Volume at Furnace Temperatures. Porosity and Volume Changes of Clay Fire Bricks at Furnace Temperatures, George A. Loomis. Technologic Papers Bur. of Standards, no. 159, April 26, 1920, 29 pp., 3 figs. Experimental investigation. Bricks which were capable of withstanding pressure of 40 lb. per sq. in. at 1350 deg. cent. showed slight changes in volume or porosity when burnt at temperatures up to 1425 deg. cent. Large number of bricks which failed to pass load test showed marked change in volume or in porosity at some temperatures below 1425 deg. cent. Bricks which showed distinct overburning by pronounced expansion at temperatures below 1400 deg. cent. invariably failed in load test.

Tests. Looking for a Brick, H. D. Fisher. Combustion, vol. 2, no. 2, Feb. 1920, pp. 12-15, 6 figs. Results of tests of various types of firebrick made to determine extent to which each possessed desirable qualities which writer believes should be: (1) infusibility, (2) resistance to fluxing action by coal ash, (3) mechanical strength, (4) resistance to spalling with sudden temperature changes, and (5) permanency of form.

FIRECLAYS

British. The Composition, Drying and Firing Shrinkage, Porosity, and Density of British Fireclays Suitable for Glass Furnace Refractory Materials, Edith M. Firth, F. W. Hodkin and W. E. S. Turner. Jl. Soc. of Glass Technology, vol. 4, no. 14, Aug. 1920, pp. 162-205, 27 figs. Chemical analyses of 27 different clays, drawn from various sources in England, Wales and Scotland and measurements of their shrinkages, porosities, apparent and actual densities at long series of temperatures up to 1400 deg. cent., and information concerning their working properties and their color changes when fired.

Mixtures for High Temperatures. Fire Clay Mixtures for High Temperatures, Raymond M. Howe. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 157-160, 7 figs. Points out harmful results which may follow addition of certain foreign materials to ground fireclay and good results obtained by adding ground bats.

Mortars, Tests of. Tests of Fire Clay Mortars, Raymond M. Howe. Gas Age, vol. 45, no. 4, Feb. 25, 1920, pp. 174-176, 7 figs. Addition of ground bats was found beneficial.

The Use of Fire-Clay in Laying Fire-Clay Bricks, Raymond M. Howe. Gas Jl., vol. 149, no. 2962, Feb. 17, 1920, pp. 366-368, 7 figs. Experiments to determine effect of adding different amounts of water, glass, salt, portland cement, carborundum, asbestos and lime to plastic fireclay.

FIREDAMP

Alsatian Potash Mine. Firedamp in the Salt Mines of Upper Alsace (Le grison dans les mines de sel de la Haute-Alsace), Charles Kissel. Bulletin de la Société Industrielle de Mulhouse, vol. 85, no. 3, Nov.-Dec. 1919, pp. 412-427, 7 figs., partly on four supp. plates. Escape of firedamp in potash mine was reported in March 1919. Causes are analyzed and possibilities of its formation in saline deposits are discussed.

Detectors. See COAL MINES, Firedamp Detectors.

FIRELESS COOKERS

Construction. Fireless Cookers of Different Types (Ueber Kochkisten verschiedener Bauart). Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 11, Mar. 13, 1920, pp. 167-171, 9 figs. Results of tests with various types. States that in selecting a cooker it is advisable to choose one no larger than absolutely required; the economy of fireless cookers is greatly augmented by the use of heating plates. Report from the Gas Experimental Station.

FIREPROOFING

Concrete for. Fireproofing Wooden Structures with Concrete. Concrete Products, vol. 18, no. 6, June 1920, pp. 21-22, 2 figs. Tells of a group of wooden buildings for large petroleum refinery in Texas, where, to protect wooden members from fire, an envelope of reinforced concrete was applied by a cement gun. Manner of doing work is described, and method is said to have met with general favor wherever applied.

Wood. See WOOD, Fireproofing.

FITS

Fiber Stresses. Determination of Fiber Stress Caused by Force Fits. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 533-534, 2 figs. Charts based on Birnie's formula for thick, hollow cylinders, adapted to case where external pressure is zero.

Limits for. "Limits" and Their Application to Practice, W. Grocock. Eng. & Indus. Management, vol. 3, no. 23, June 3, 1920, pp. 707-711. Deals with tabulation of limits that will give the fits required by designer, and gives Newall standard tables of limits, Newall's force fit, push fit and running fit, and the Johansson limit system.

Tolerances and Allowances. See MACHINE CONSTRUCTION, Tolerances and Allowances.

[See also GAGES, Tolerances.]

FIXTURES

See JIGS, Examples of.

FLAME

Acetylene, Spectral Distribution of. On the Distribution of Energy in the Visible Spectrum of an Acetylene Flame, E. P. Hyde, W. E. Forsythe and F. E. Cady. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 379-388, 1 fig. Spectral distribution of flame was measured by means of spectrophotometer and spectral pyrometer. Results gave curve agreeing within limits of error with that of black body at 2360 deg. K.; in extreme red, beyond 0.70 there was indication of higher emissivity for acetylene.

FLAME PROPAGATION

Complex Gaseous Mixtures. The Propagation of Flame in Complex Gaseous Mixtures. The Uniform Movement of Flame in Mixtures of Methane, Oxygen and Nitrogen. "Maximum-Speed Mixtures" of Methane and Hydrogen in Air, William Payman. Jl. Chem. Soc., no. 687, Jan. 1920, pp. 48-58, 6 figs. Comparison of speeds of detonation-wave and uniform movement. Photographic records of movement of flame.

Engine Cylinders. The Velocity of Flame Propagation in Engine Cylinders, Donald MacKenzie and R. K. Honaman. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 119-122, 5 figs. Method is described for measuring rate of flame propagation in gaseous mixtures. Method depends upon fact that bodies at high temperature ionize space about them. Empirical expression for velocity of flame propagation is formulated from results of experiments.

Methane-Air Mixtures. The Propagation of Flame in Mixtures of Methane and Air—Horizontal Propagation, Walter Mason and Richard Vernon Wheeler. Jl. Chem. Soc., no. 687, Jan. 1920, pp. 36-47, 5 figs. Photographic analysis of flame.

The Propagation of Flame in Complex Gaseous Mixtures. The Uniform Movement of Flame in Mixtures of Air with Mixtures of Methane, Hydrogen and Carbon Monoxide, and with Industrial Inflammable Gases, William Payman. Jl. Chem. Soc., vols. 115 and 116, no. 686, Dec. 1919, pp. 1454-1462, 3 figs. Experiments with mixtures saturated with water vapor at ordinary temperature and pressure.

Pipes. See PIPES, Flame Propagation.

Velocity and Gas Pressure. Flame Velocity in Inflammable Gases, J. D. Morgan. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 535-536, 7 figs. Derivation of expression establishing proportionality between flame velocity and gas pressure during combustion of inflammable gases.

Wire Gauze. The Passage of Flame through Wire Gauze. Colliery Guardian, vol. 120, no. 3115, Sept. 10, 1920, pp. 725-728, 9 figs. Deals with safety of gauzes in relation to their ability to resist passage of flame of an explosion occurring within the safety lamp to which they are fitted. Results of experiments with shaped gauze cylinders. Report by Miners' Lamps Committee.

FLAME REACTIONS

Selenium and Tellurium. Flame Reaction of Selenium and Tellurium, Harry B. Weiser and Allen Garrison. Chem. News, vol. 110, no. 3108, Nov. 7, 1919, pp. 214-217. Probable causes of colorations produced in flames.

FLAT PLATES

See PLATES, Flat.

FLIES

Extermination. See SANITATION, Fly and Mosquito Elimination.

FLIGHT

Above-Cloud. Flying Over Clouds in Relation to Commercial Aeronautics, B. Melville Jones. Aeronautics, vol. 18, no. 335, Mar. 18, 1920, pp. 240-243. Points out possibilities of navigating over clouds by (1) dead reckoning, (2) observation of heavenly bodies, (3) direct observation of fixed balloons; or (4) help of wireless.

Analysis. Flight-Course Analysis with the Aid of Photogrammetry (Flugbahnanalyse mit Hilfe der Photogrammetrie), Richard Katzmayr. Motorwagen, vol. 23, nos. 3 and 5, Jan. 31 and Feb. 20, 1920, pp. 46-53 and 91-96, 18 figs. Results of experiments begun in 1914 and continued in 1918. Brief discussion of photogrammetric method of measuring and its use in aeromechanics. Describes two methods for bringing time in definite relation to course traveled. Details of instruments used and of photograms taken.

England to Australia. From England to Australia in a Giant Aeroplane (Im Grossflugzeug von England nach Australien), Roland Eisenlohr. Motorwagen, vol. 23, no. 17, June 20, 1920, pp. 306-308, 2 figs. Describes remarkable flight of the Smith brothers over a distance of 18,200 km. in period of thirty days, with details of the Vickers-Vimy plane used in flight which is said to show evidence of influence of German construction, especially of the newer type of Gotha machine delivered to England according to Treaty terms, and to prove that for such long and difficult flights, only machines with two or more engines can be considered.

High-Altitude. Flying at Very High Altitudes (La vie et les voyages aux trés hautes altitudes), Docteur Guglielmineti. Génie Civil, vol. 76, no. 12, Mar. 20, 1920, pp. 288-292, 7 figs. Physiological effects of altitudes greater than 12,000 meters (39,360 ft.). It is at such altitudes, it is said, that aerial routes for transoceanic service will have to be established in order to attain maximum practicable speed. Structural details of enclosed cabin for maintaining constant air pressure are given.

Indicators. See AERONAUTICAL INSTRUMENTS, Flight Indicators; Turn Indicator.

Physics of. The Physics of Flight, David L. Webster. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 553-580, 8 figs. Laws of aerodynamics are stated and their application to flight of aeroplanes discussed.

Rectilinear. The Rectilinear Flight of Aeroplanes, A. Rateau. Mech. Eng., vol. 42, no. 5, May 1920, pp. 268-269 and 316, 1 fig. Principles of analytical theory of rectilinear flight of aeroplanes are formulated. Graph is constructed indicating variation of fuel and oil consumption per distance of flight with variation in distance of plane from its ceiling during flight.

Safety in. Safety in Flight, R. K. Bagnall Wild. Aeronautical Jl., vol. 24, no. 116, Aug. 1920, pp. 418-439, 12 figs. Factors to which civilian flying owes its present safety. How safety can be maintained in future.

Soaring. Soaring Flight (Le vol à voile), H. Liurette. L'Aérophile, vol. 28, nos. 1-2, Jan. 1-15, 1920, pp. 6-17, 5 figs. See also Nature (Paris), no. 2419, Aug. 14, 1920, pp. 109-112, 6 figs. Theory is developed to account for flight of birds which without batting wings advance against the wind and rise in atmosphere. Bird soaring flight is considered as forming "supporting propulsive" system constituted by mass displaced from position of stable equilibrium. Mechanical applications of soaring flight are visualized.

Soaring in Horizontal Wind of Invariable Speed and Direction (Le vol à voile par vent horizontal de vitesse et de direction invariables), Jean Viley et A. Volmerange. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 14, Apr. 6, 1920, pp. 838-841, 1 fig. Study of forces acting on bird.

Theory of Soaring Flight (Étude du vol à la voile dans la Haute-Guinée), M. P. Idrac. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 5, Feb. 2, 1920, pp. 269-272. From records of observations of direction and velocity of wind and calculated absolute velocity of bird, forces operating in flight are determined.

See also AEROPLANES, Soaring Flight.

Tail Plane, Setting of. A Method for Determining the Angular Setting of a Tail Plane to Give Balance at any Given Condition. Air Service Information Circular, vol. 2, no. 102, Aug. 15, 1920, 7 pp. Method includes determination of proper angular setting of horizontal tail plane to give longitudinal balance at following flight conditions: (1) level flight at any speed, (2) climbing flight at best rate of climb, (3) gliding at any angle with power off, and (4) conditions (1), (2) and (3) at any altitude.

Transatlantic. New York-London Airship Line Service is Planned, Allen Sinsheimer. Automotive Industries, vol. 41, no. 23, Dec. 4, 1919, pp. 1099-1103 and 1115, 5 figs. Report issued by Vickers, Ltd., on flying schedule, necessary capital, rate of fare, mail and freight charges and cost and location of necessary terminals.

Transcontinental. Report on First Transcontinental Reliability and Endurance Test Conducted by the Air Service, U.S.A., October 8 to October 31, 1919. Air Service Information Circular, vol. 1, no. 2, Feb. 5, 1920, 35 pp., 1 fig. Experience is discussed principally with regard to influence of organization of personnel in successfully undertaking long-distance flights, and account is given of difficulties encountered in above-cloud flying and other aeronautical problems.

Trans-Pacific. Possibilities of a Trans-Pacific Flight, G. C. Westervelt and H. B. Sanford. U. S. Naval Inst. Proc., vol. 46, no. 5, May 1920, pp. 675-712, 6 figs. Discusses types of machines available, distribution and physical conditions of possible landing places, and meteorological conditions of various routes.

Wave Soaring. Wave Soaring, W. T. Thomas. Aerial Age, vol. 11, no. 18, July 12, 1920, pp. 616-617, 7 figs. Information on a form of soaring flight employed by brown pelicans on east coast of Florida. It is concluded from analysis of conditions that a well-built aeroplane could exactly reproduce this form of flight, provided that waves of proportionate size existed.

[See also AVIATION.]

FLOATING DOCKS

See DRYDOCKS, Floating.

FLOOD CONTROL

B. E. F., France. Inundation Work with the British Expeditionary Force in France, G. L. Shanks. Jl. Eng. Inst. of Canada, vol. 3, no. 8, Aug. 1920, pp. 393-402, 7 figs. Records of work in field.

Creek-Channel Diversion. Flood Protection Project for Council Bluffs. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 596-598, 3 figs. Diverting creek from present channel through city and discharging into Missouri River near upper end of Council Bluffs, Ia., is method of protection against flood in creek.

Erie, Pa. Progress and Costs on Erie, Pa., Flood Control Project, Farley Gannett. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 852-854, 3 figs. Construction of detaining dams.

Miami Conservancy District. Effect of Flood on Miami Conservancy Work. Eng. World, vol. 17, no. 1, July 1920, pp. 1-5, 5 figs. Operation and action of hydraulic pump as utilized in outlet works of district dams.

Experiments on the Flow of Water Through Contractions in an Open Channel, E. W. Lane. Proc. Am. Soc. Civil Engrs., vol. 45, nos. 8-9-10, Oct.-Nov.-Dec. 1919, pp. 717-774, 20 figs. Studies for design of flood prevention works of Miami Conservancy District. Measurements were made of flow through (1) contraction with rounded edges, (2) sharp-edged contraction, (3) short flume with rounded entrance, (4) short flume with sharp corner entrance, and (5) expanding or venturi flume.

Flood Control Work in the Miami Conservancy District. Public Works, vol. 48, no. 5, Feb. 14, 1920, pp. 91-95, 3 figs. General plan and preparatory work are described. Table is included giving dimensions of dams and appurtenances.

Principles of Channel Improvement in Miami Valley Flood Protection. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 292-298, 10 figs. Flow capacity of river increased to supplement action of detention basins. Bottom of enlarged channel shaped for low-water flow. Scour protection by concrete revetment, block mattresses and sills.

Propagation. Propagation of Floods and Their Forecast (Note sur la propagation des crues et leur prévision journalière), M. Pigeaud. Annales des Ponts et Chaussées, vol. 51, no. 4, July-Aug. 1919, pp. 29-57, 6 figs. Determining propagation in water course by Graeff system, which is based on gaging graphs establishing at various points definite relation between amount of water passing per second and level to which it rises.

Savannah River. Floodgates Proposed for Control of Savannah River, E. C. Garoin. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 873-874, 1 fig. Movable dam at mouth of unused channel would permit concentration of ebb to scour main ship channel.

Winnipeg. Flood Prevention Projects to Protect Winnipeg, Douglas L. McLean. Can. Engr., vol. 38, no. 14, Apr. 1, 1920, pp. 333-335, 4 figs. It is predicted that unless works are constructed to control flood waters of Red River of the North, next inundation at Winnipeg may cause damage totalling millions of dollars. Reservoirs, dikes and channel improvements are proposed.

[See also LEVEES; RIVERS, Scioto, Improvement of.]

FLOORS

Concrete. Calculation of Stresses in Reinforced-Concrete Floors by Considering These as Thin Plates of Simple Orthogonal Anisotropy (Théorie rationnelle des hourdis en béton armé, considérés comme des plaques minces, d'une simple anisotropie orthogonale), M. T. Huber. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 9, Mar. 1, 1920, pp. 511-513. Solution of differential equation of elastic surface.

Charts Giving Thickness and Reinforcement of Reinforced-Concrete Floor Slabs (Diagrammes donnant les épaisseurs et les reforcements des dalles de hourdis en béton armé), Henri Kampmann. Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 312-314, 3 figs. One chart gives thickness for slab of known length required to support known load, and another the reinforcement required for slab.

Floor Hardener Tests by Bureau of Standards. Concrete, vol. 16, no. 6, June 1920, pp. 279-280. Service tests of concrete floor hardeners. Types tested were magnesium fluosilicates, varnishes and paints, waxes and various preservatives.

Recommendation for Practice in Testing Floors of Concrete Buildings, W. A. Slater. Can. Engr., vol. 38, no. 21, May 20, 1920, pp. 484-486. Excerpts from report of chairman of Committee on Tests of Reinforced Concrete Floors, American Concrete Inst.

Report on Test of Two-Way Tile and Concrete Floor. Eng. News-Rec., vol. 84, no. 23, June 3, 1920, pp. 1118-1119, 1 fig. Gives preliminary results of stress-deformation records made on experimental structures by Bureau of Standards. Tile was shown to be effective in resisting compressive stresses, deformations

observed in tile being approximately 70 per cent of deformations in concrete. Gives negative and positive bending moment for interior and exterior square panels.

Concrete Slab. Construction and Falsework of Bauer-Mautner Type of Reinforced-Concrete Flat-Slab Floors (Herstellung und Einschalung von Eisenbetonpilzdecken nach System Dr. Bauer u. Dr. Mautner, Düsseldorf). Beton u. Eisen, vol. 19, no. 1, Jan. 8, 1920, pp. 13-14, 1 fig. Description of a new system of cantilever flat-slab or mushroom construction, chief features of which are a cast-iron column core, a stiff supporting cantilever as link between column and floor and a suspension arrangement for the falsework.

Hollow-Block. A New Hollow Block for Floors (Der neue Deckenhohlstein "Berra"), Fritz Rücker. Ziegelwelt, vol. 50, no. 84, Nov. 22, 1919, pp. 538-540, 7 figs. Describes the Berra triangular hollow block, manufactured by Berkes & Co., Ltd., Worms, demonstrating its uses in floor, stairway and column construction.

Tile and Concrete. Tile and Concrete Floor Shows to Advantage Under Test. Am. Architect, vol. 118, no. 2329, Aug. 11, 1920, pp. 193-199, 5 figs. Investigation by Bur. of Standards. Purpose was to obtain data to serve as basis for design of concrete and hollow-tile floor reinforced in two directions.

FLOTATION

Adsorption Conditions. Flotation from the Standpoint of Colloidal Chemistry (Die Schwimmaufbereitung vom Standpunkt der Kolloidchemie), P. Vageler. Metall u. Erz, vol. 17, no. 5, Mar. 8, 1920, pp. 113-119. Writer maintains that as a purely qualitative method of investigation the flotation method is the most unsuitable; but recommends as promising genuine success in regard to the whole problem; a quantitative, systematic study of the absorption conditions in three-phase and multi-phase systems of the most important ores in connection with the technical reagents. Address delivered before Soc. of German Met. & Min. Engrs.

Bradford Process. Selective Flotation by the Bradford Process. Eng. & Min. Jl., vol. 109, no. 12, Mar. 20, 1920, pp. 700-701. Method as developed at Broken Hill, Australia, is said to be particularly suited to separation of lead-zinc sulphides and to possess advantages over electrolytic, Norwood, magnetic and other treatments.

Concentrator. The Remodeled Arizona Hercules Concentrator, J. T. Shimmin. Eng. & Min. Jl., vol. 109, no. 20, May 15, 1920, pp. 1115-1117, 3 figs. Capacity of original mill increased by installing jigs and otherwise rearranging flow sheet; new reagent developed to float oxides and metallics; change in design of pneumatic cells said to have proved successful.

Controlling Elements. Some Controlling Factors in Flotation, Ralph D. Nevett. Australasian Inst. of Min. & Metallurgy, Proceedings, no 37, March 31, 1920, pp. 55-65 and (discussion) pp. 65-72. Suggestions to metallurgists supervising operations of flotation plants.

Froth Process. Flotation, Arthur F. Taggart. Jl. Franklin Inst., vol. 189, no. 4, Apr. 19[illegible] pp. 485-498, 8 figs. Two essentials to successful flotation are said to be (1) selection of the valuable mineral from the gangue and (2) formation of a froth of sufficient stability to allow for its separation from the bulk of pulp. Gives series of experiments explaining mechanics of froth formation, and describes three types of commercial froth flotation machines.

Froth-Flotation at Broken Hill, C. C. Freeman. Australasian Inst. Min. & Metallurgy, no. 36, Dec. 31, 1919, pp. 89-195 and (discussion) pp. 105-110. Also in Min. & Sci. Press, vol. 120, no. 23, June 5, 1920, pp. 833-838. Writer explains some phases of froth flotation, especially as applied to local ores, from practical point of view, and states that although practical side of flotation knowledge has made great strides, many phenomena have not yet been satisfactorily explained.

Froth Flotation: Its Commercial Application and Its Influence on Modern Concentration and Smelting Practice, Walter Broadbridge. Bul. Instn. Min. & Metallurgy, no. 184, Jan. 1920, pp. 1-58, 31 figs. Froth flotation process as practiced on large scale is described and difficulties are illustrated which occur in transition from gravity method to froth-flotation concentration. A brief review is appended of recent progress in flotation, including differential separation.

Low-Grade Copper Ores. Developing a Mill Flow Sheet at Morenci, Ariz., Arthur Crowfoot and Ernest Wittenau. Eng. & Min. Jl., vol. 109, no. 25, June 19, 1920, pp. 1349-1354, 4 figs. Method of treating low-grade copper sulphide ores. Shallow type of pneumatic flotation cells devised.

Machines. A New Flotation Machine, A. W. Fahrenwald. Pahasapa Quarterly, vol. 9, no. 3, April 1920, pp. 125-130. Pneumatic machine designed without porous bottoms.

The Du Faur Flotation Machine, B. Du Faur. Chem. Eng. Min. Rev., vol. 12, no. 143, Aug. 5, 1920, pp. 395-398, 2 figs. Patented machine designed for recovery of copper contents of roasted pyrites carrying copper and zinc.

The Fahrenwald Flotation Machine, Francis A. Thomson. Min. & Sci. Press, vol. 120, no. 24, June 12, 1920, pp. 871-873, 4 figs. Machine consists of stationary hollow tube, to lower end of which upper and lower housings and enclosing impeller are suitably secured. Upper side of impeller runs in air and lower side is in contact with small fraction of pulp. This, it is said, eliminates vortical and eddying action characteristic of paddle-agitator machines.

Molybdenite. See MOLYBDENITE.

Murex Method. Mechanical Treatment of Ores (Préparation mécanique des minerais), F. Bronckart. Revue Universelle des Mines, vol. 2, no. 2, June 1919, pp. 325-366, 5 figs. Description of flotation and of Murex method, which also implies selective action of oil but is not a method of flotation.

Oil Substitutes. The Use of Naphthylamin and Xylidin in Flotation, Edward H. Robie. Eng. & Min. Jl., vol. 108, no. 18, Nov. 1, 1919, pp. 730-732. It is claimed that improved recoveries and more easily dewatered concentrate result from substitution of these chemicals for oil.

Phenomena Involved. A Contribution to the Study of Flotation, H. Livingstone Sulman. Min. & Sci. Press, vol. 120, nos. 1, 2 and 4, Jan. 3, 10 and 24, 1920, pp. 14-16, 47-52 and 122-124, 5 figs. Also in Bul. Instn. Min. & Metallurgy, no. 182, Nov. 1919, pp. 1-95, 23 figs. Explanation of facts along lines of molecular hypothesis; physical phenomena involved. Paper read before Instn. of Min. & Metallurgy.

Present Status of. The Present Status of Flotation, Rudolf Gahl. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 197-200. No revolutionary step in development of flotation process is said to have occurred during 1919, but minor developments are believed to have been originated.

Processes and Applications. Flotation of Minerals (Le flottage des minerais), Fernand Bronckart. Revue générale des Sciences pures et appliquées, vol. 31, no. 1, Jan. 15, 1920, pp. 5-17, 5 figs. Definition of flotation is discussed together with its technical and economical importance, brief historical survey of its industrial development is presented and various processes are classified and described.

Quicksilver Ore. Experimental Flotation of Low-

Grade Quicksilver Ore, E. G. Stowell and Will H. Coghill. Min. & Sci. Press, vol. 120, no. 4, Jan. 24, 1920, pp. 117-121, 3 figs. Results of coöperative investigation by U. S. Bureau of Mines and Oregon Bureau of Mines and Geology.

Separation of Colloids. Suggestions for Separating Colloids from Flotation Feed, Bennett R. Bates. Eng. & Min. Jl., vol. 109, no. 9, Feb. 28, 1920, p. 552. States that feed water must be kept clean for good results. Use of large thickener or proper classifier is advocated.

Suan Concession. Technical Operations on the Suan Concession, Korea, A. R. Weigall and J. F. Mitchell-Roberts. Min. & Sci. Press, vol. 119, no. 24, Dec. 13, 1919, pp. 843-847, 2 figs. Flotation in both mills; cyanidation; tube-milling.

Surface Phenomena. The Mechanism of the Surface Phenomena of Flotation, Irving Langmuir. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 62-74. Experiments are said to show clearly that oil films of molecular thickness are sufficient to alter radically the surfaces of solids, and that new viewpoint is applicable to flotation processes.

Testing Ores for. Testing Ores for Flotation, James M. Hyde. Min. & Sci. Press, vol. 121, no. 14, Oct. 2, 1920, pp. 481-486, 8 figs. Pneumatic machine for continuous testing.

Theory of. A Résumé of Literature on the Theory of Flotation with Critical Notes, H. R. Adam. Jl. Chem. Metallurgical & Min. Soc. of So. Africa, vol. 21, no. 2, Aug. 1920, pp. 17-24. Summary of principles set forth in text books and technical articles in magazines during last five years.

FLOUR MILLS

Construction. Modern Flour-Mill Construction (Neuzeitlicher Mühlenbau), Fr. Kettenbach. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 37 and 38, Sept. 11 and 18, 1920, pp. 733-737 and 767-770, 27 figs. Presents diagram showing course of milling process through a modern flour mill, and gives details of latest improvements and innovations in the different installations and machines, including grain storage plant, haulage plants, measuring devices, cleansing machines, grain washing and drying plants, husk-removing machines, rolling mills, etc. Description of flour-improving process for the preparation of domestic wheat.

FLOW IN PIPES

Gases. The Hot-wire Anemometer: Its Application to the Investigation of the Velocity of Gases in Pipes, J. S. G. Thomas. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 505-534, 18 figs. partly on 4 supp. plates. Experiments carried out at Physical Laboratory of South Metropolitan Gas Co.

Steam. See STEAM, Flow in Pipes.

FLOW OF AIR

Small Tubes. The Flow of Air Through Small Brass Tubes, T. S. Taylor. Mech. Eng., vol. 42, no. 6, June 1920, pp. 334-335, 2 figs. Flow of air through brass tubes ⅝ in., ⅞ in. and 1½ in. in diameter was studied by means of small pitot tubes. It was observed that velocity distribution did not become constant in tubes of these dimensions until air had passed through length of about 200 cm. Ratio of average velocity to maximum velocity at center was found to have value of from 0.82 to 0.85 for all velocities for each of tubes tested.

Venturi-Meter Calculations. Simplification of Venturi-Meter Calculations, Glenn B. Warren. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 220-221 and 260, 3 figs. Graphs for facilitating slide-rule calculation of flow of compressed air, also suggested simplification of venturi-meter formula given by Herbert B. Reynolds in Trans. Am. Soc. M. E., vol. 38, p. 799.

Venturi-Meter Measurement of. The Measurement of Air Flow by Venturi Meter, A. H. Gibson. Jl. Instn. Mech. Engrs., no. 7, Oct. 1919, pp. 593-603, 2 figs. Experimental calibration of two meters carried out with a view to gathering data as to value of coefficient of discharge of Venturi meter operating under such varied conditions as obtain in aero-engine work.

Visualization of. See WIND TUNNELS, Air-Flow, Visualization of.

FLOW OF FLUIDS

Laws. The Laws of Elastico-Viscous Flow. Jl. Geology, vol. 28, no. 1, Jan.-Feb. 1920, pp. 18-24. Concerning combination of laws of Larmor and of Maxwell proposed by Harold Jeffreys (see monthly notices of Royal Astronomical Soc., vol. 77, no. 5). First article appeared in Jl. Geology, vol. 25, 1917, pp. 405-410.

Measurement. An Instrument for Measuring the Flow of Fluids, Cornelius Weber. Power, vol. 50, no. 19, Nov. 11-18, 1919, pp. 702-703, 3 figs. It consists of universal pitot tube with pressure gage and manometer.

Stream-Line Flow. Stream-Line Flow from a Disturbed Area, A. R. Richardson. Lond., Edinburgh and Dublin Phil Mag., vol. 38, no. 226, Oct. 1919, pp. 433-452, 5 figs. Study of vortices caused by viscosity and of effect of alteration in shape on resistance of body moving at given speed.

Turbulent Motion. On the Conditions at the Boundary of a Fluid in Turbulent Motion, T. E. Stanton, Dorothy Marshall and Mrs. C. N. Bryant. Proc. of Roy. Soc., vol. 97, no. 687a, Aug. 3, 1920, pp. 413-434, 11 figs. Experimental research into phenomena of skin friction of solid surfaces due to flow over them of fluids whose motion, not in immediate vicinity of surface, is eddying or turbulent.

Vortices. On the Stability of Two Rectilinear Vortices of Compressible Fluid Moving in an Incompressible Liquid, Bibhutibhusan Datta. Lond., Edinburgh and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 235, July 1920, pp. 138-148. Consideration of the following particular cases: Two columns of fluids of varying density possessing no vorticity; two rectilinear vortices in an incompressible fluid; a vortex pair; and a single vortex parallel to an infinite wall.

The Mass Carried Forward by a Vortex, W. M. Hicks. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 597-612, 2 figs. Relationship between cyclic and acyclic irrotational motions of vortex aggregate moving steadily through irrotational liquid.

FLOW OF GASES

Flow Indicator. The Indication of the Rate of Flow of Gases, Rudolph L. Hanau. Welding Engr., vol. 4, no. 11, Nov. 1919, pp. 26-29, 2 figs. Operation of hydrex flow indicator used for measuring gases supplied for welding and cutting.

Multi-dimensional. Multi-dimensional Flow of Gases (Mehrdimensionale Strömung von Gasen), Gustav Flügel. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 17, June 20, 1919, pp. 161-165, 2 figs. Discussing stationary level flow, stationary flow symmetrical about the axis, and rotating stationary flow in rotating canal.

Nozzles and Turbine Buckets. The Flow of Gas in Nozzles and Impulse Turbine Buckets at Velocities greater than that of Sound (Die Strömung eines Gases in Düsen und Gleichdruckschaufeln mit Ueberschallgeschwindigkeit), A. Wewerka. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 30, July 26, 1919, pp. 699-705, 19 figs. Discussing flow in nozzles

with bent axis; flow in impulse turbine buckets (a) in theoretical bucket with unresisted flow, (b) in actual bucket, showing losses in flow.

Orifices. Efflux of Gases Through Small Orifices, Edgar Buckingham and Junius David Edwards. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 359, Jan. 28, 1920, pp. 573-615, 8 figs. partly on 7 supp. plates. Experiments with number of orifices and with several gases, densities of which have been determined gravimetrically, are said to have given surprising discrepancies and irregularities in rates of effusion. It is concluded that difficulties encountered in determination of specific gravities by effusion method cannot all be ascribed to faulty procedure or unsatisfactory manipulation but represented inherent characteristics of method itself. Experiments are related which were performed for the purpose of comparing equations for adiabatic flow of ideal gas through frictionless orifice.

Gas Measurements with Plain Orifices, A. H. Blaisdell. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 801-803, 4 figs. Gives formula for measurement of flow of moisture-laden gases.

Three-Dimensional Flow. Three-Dimensional Flow of Gases (Mehrdimensionale Strömung von Gasen), Gustav Flügel. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 18, June 30, 1919, pp. 178-180, 2 figs. Stationary axial flow in a diaphragm and stationary rotating axial flow in a rotor are described.

FLOW OF LIQUIDS

Bernoulli Formula. On the Application of Bernoulli Formula (Sur la formule de Bernouilli et ses conditions d'emploi), Emile Cotton. Technique Moderne, vol. 12, no. 7, July 1920, pp. 304-306, 1 fig. Generalization of formula.

Whirls Through Orifice. Perrot's Experiment Relative to Rotation of the Earth (Sur l'expérience de Perrot relative au mouvement de rotation de la Terre), Joseph Rey. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 6, Aug. 9, 1920, pp. 343-344. According to Perrot, when a liquid at rest in a cylindrical container starts flowing through orifice in center of bottom, whirls are produced in mass of liquid which bear definite relation to earth's rotation. Writer of present note reports that in numerous experiments he performed he was unable to confirm Perrot's contention.

See also FLOW OF OIL; FLOW OF WATER.

FLOW OF OIL

Pipes. The Flow of Oil in Pipes, Arthur C. Preston. Chem. & Metallurgical Eng., vol. 23, nos. 13 and 14, Sept. 29 and Oct. 6, 1920, pp. 607-613 and 685-689, 4 figs. General method for determining friction loss of any liquid from its saybolt viscosity; with tables for pipes from one to six inches in diameter.

FLOW OF STEAM

Pipe Sizes. Charts for Graphical Determination of Pipe Sizes and Velocity of Flow of Steam, H. M. Brayton. Power, vol. 51, no. 17, Apr. 27, 1920, pp. 662-666, 4 figs. Gives two charts for all usual pipe lines, and also shows how reader may construct such charts.

FLOW OF WATER

Channels. Hydraulics of the Chicago Sanitary District's Main Channel, Murray Blanchard. Jl. Western Soc. Engrs., vol. 25, no. 13, Sept. 5, 1920, pp. 471-524, 30 figs. Investigation of flow of main channel covering period of three years, 1914-1916 and part of 1917. Work involved series of current meter measurements extending over entire time in order to obtain sufficient range in stage of Lake Michigan in connection with varied stages at Lockport Power House, to give variety of conditions at uniform flow from which law of flow in rock section below Willow Springs could be derived.

Condenser Tubes. See CONDENSERS, STEAM, Tubes, Flow Through.

Discharge Coefficients. Discharge Co-efficients for Canal Head Gates, J. S. Longwell and Julian Hinds. Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 31-35, 11 figs. Method is outlined for study of capacity as related to existing head gates and application of results obtained to design of future structures.

Ditches. Flow of Water in Ditches. Public Works, vol. 49, no. 11, Sept. 11, 1920, pp. 229-231, 3 figs. Experiments conducted by engineers of Bur. of Roads to determine proper values of coefficient in Kutter's formula for various conditions of channels in earth. Conditions are indicated by photograph, cross-section and description.

The Flow of Water in Dredged Drainage Ditches, C. E. Ramser. U. S. Dept. of Agriculture, bul. no. 832, June 7, 1920, 60 pp., 52 figs. Results of experiments to determine roughness co-efficient, n, in Kutter's formula.

Flow Recorder. The Rheograph Water Flow Recorder. Engr., vol. 130, no. 3367, July 9, 1920, pp. 42-43, 2 figs. Describes new form of flow recorder arranged to read the flow in gallons per hour against a quadrant scale, and also to record the flow on a chart surrounding a time drum.

Groundwater. The General Law of Groundwater Flow (Das allgemeine Grundwasserfliessgesetz), H. Zunker. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, nos. 21 and 22 May 22 and 29, 1920, pp. 331-334 and 350-353, 6 figs. Writer refers to the various existing formulæ and claims as a result of his experiments that none of these express accurately the law of groundwater flow, the Krüger filter formula, however, agreeing most closely with them.

Measurement of. Experiments on Water Flow Measurements in Pipes by Means of a Pitot Tube Placed in Pipe (Vattenmätningsförsök i rörledningar medelst i ledningar införda pitotrör), Einar Lundström and Georg Haglund. Teknisk Tidskrift, vol. 49, nos. 9-10/B, Sept., Oct. 1919, pp. 113-121, 29 figs. Comparison of various methods and details of experiments with pitot tube. Bibliography.

Measurement of the Flow of Small Water Courses (Mesure du debit des petits cours d'eau), R. Sivoine. Electricien, vol. 49, no. 1241, Nov. 30, 1919, pp. 223-225, 4 figs. Formulæ used in connection with various methods.

Philadelphia Fights Water Waste, William M. Crowe. Fire & Water Eng., vol. 66, nos. 19-22, Nov. 5, 12, 19 and 26, 1919, pp. 968-971, 7 figs. Account of taking measurements of pump discharge by pitot tube.

Open Channels. See FLOOD CONTROL, Miami Conservancy District.

Orifices. Flow of Water through Orifices (Sur le régime permanent dans les chambres d'eau), M. C. Camichel. Revue générale de l'Électricité, vol. 8, no. 11, Sept. 11, 1920, pp. 331-338, 16 figs. Flow of water out of tank through orifice at bottom was studied by photographing at various times positions of particles in suspension which reflected light from adequately located source. From results obtained existence of equipotential surfaces of velocity throughout mass of water is established and formulæ are developed to express distribution of velocities.

Reservoirs. Equilibrium of Water Flowing Into Reservoir (Sur le régime permanent dans les chambres d'eau), M. C. Camichel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 17, April 26, 1920, pp. 986-988. General formulæ giving distribution of veloci-

ties in liquid mass according to three rectangular axes.

Sluices, Measurement of. Measurement of the Quantity of Water Passing Through a Certain Sluice (Note sur calcul du débit des vannes), L. Imbert. Revue générale de l'Électricité, vol. 7, no. 2, Jan. 10, 1920, pp. 53-56, 5 figs. Suggested procedure.

Velocity Determination. The Formula for Velocity of Water in Constant Discharge (Die Geschwindigkeitsformel für stetig ausfliessendes Wasser; eine Zeit- und Streitfrage), M. Graevell. Zeitschrift für das gesamte Turbinenwesen, vol. 16, nos. 24 and 25, Aug. 30 and Sept. 10, 1919, pp. 245-250 and 262-264. After calling attention to present-day general use of the Toricelli formula in preference to that of Newton, writer refers to works of A. Hofmann in defense of the Newton formula for constant outflow and presents new formulæ. He concludes that discharge velocity depends on prevailing pressure head and the discharge volume on the size of discharge opening and the accompanying velocity; and for a constant discharge in a state of inertia the volume of inflow must be equal to that of outflow.

Weir for Measuring. An Improved Weir for Gaging in Open Channels, Clemens Herschel. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 83-88 and 132, 6 figs. Tests with weir having 2:1 slope on both sides of hollow circular crest are said to have revealed that for discharges of from 0 to 9.55 cu. ft. per sec. per ft. of weir length quantity of water flowing was directly proportional to difference in two pressures, one measured just upstream of weir and other measured at crest.

Weirs. Studies on the Movement of Water Near a Weir (Studien über Wasserbewegung an Wehren), H. E. Gruner. Schweizerische Bauzeitung, vol. 74, nos. 20 and 21, Nov. 15 and 22, 1919, pp. 243-246 and 255-257, 12 figs. According to writer detailed study of water movement, and especially of whirlpools, yields valuable information regarding action of flowing water, which may find practical application to hydraulics. Details of whirlpools in St. Maurice River, in Rhine and in Gorge de Russille.

Wood-Stave Pipe. The Discharge of Smooth Wood-Stave Pipes and Wood Channels, Alfred A. Barnes. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 228-230. Comparisons of observed and calculated velocities in large and small pipes and open conduits of different shapes.

[See also PITOT TUBES, Integrating; WEIRS.]

FLUE-GAS ANALYSIS

Automatic Apparatus. Apparatus for Automatically Making and Recording Flue Gas Analyses (Die apparate zur selbsttätigen Vornahme und Aufzeichnung von Rauchgasanalysen), Otto Braun. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, nos. 20, 21, 22 and 24, May 15, 22, 29 and June 12, 1920, pp. 310-315, 325-330, 334-350 and 388-393, 40 figs. Results of tests of operation and accuracy of five widely used apparatus, namely, the Ados, Oekonograph, Eckardt, Pintsch and Autolysator, and details of various other foreign and domestic apparatus.

Combustion Losses. Calculations from a Flue-Gas Analysis, H. M. Brayton. Power, vol. 51, no. 7, Feb. 17, 1920, pp. 264-266. Simple way to calculate combustion losses easily is shown.

Graphic Calculation. Graphic Calculation of Flue-Gas Analyses (Zur graphischen Auswertung von Verbrennungsgasanalysen), Hans Meyer. Stahl u. Eisen, vol. 40, no. 18, May 6, 1920, pp. 605-610, 3 figs. Based on works of W. Ostwald, a method for graphic calculation of flue-gas analyses is described which is said to be applicable to every kind of fuel with slight deviations. Gives combustion charts for liquid, solid and gaseous fuels.

Orsat Apparatus. An Improved Orsat Apparatus for Gas Analysis, G. W. Jones and F. R. Neumeister. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 734-736, 4 figs. Apparatus used by Bureau of Mines.

Recording Apparatus. Flue Gas Analyzers and Recorders. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 91-95, 11 figs. Construction and method of using manually and automatically-operated apparatus.

FLUE GASES

Specific Heat. The Specific Heat of Flue Gases (Die spezifische Wärme der Feuergase), H. Hilliger. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, no. 1, Jan. 2, 1920, pp. 1-3, 2 figs. Gives values for specific heat of the separate components of flue gases from which values for the gas mixture of flue gases are derived. Notes on relation between true and mean specific heat and between different temperature limits.

Water Vapor in. The Specific Heat of the Water Vapor in Flue Gases (Die spezifische Wärme des Wasserdampfes in Feuergasen), H. Hilliger. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 10, Mar. 6, 1920, pp. 234-236, 3 figs. It is pointed out that the pressure of the water vapor in flue gases is considerably less than 1 atmos., so that as result of dependence of specific heat on pressure, the values in general use are no longer applicable. Values for low pressure are derived from results of tests carried out at Münich and the mean specific heat is determined from saturation temperature. Calculations of mean specific heat for other temperature limits are also given.

FLUIDS

Equation of State. New Correction of the Equation of State of Fluids (Sur une nouvelle amélioration de l'equation d'état des fluides), E. Aries. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 24, Dec. 15, 1919, pp. 1140-1143. Determination of function Φ by averaging values estimated for various temperatures conveniently spaced.

Flow of. See FLOW OF FLUIDS.

Thermodynamic Properties. Thermodynamic Properties of Fluids in the Vicinity of Their Critical State (Les propriétés thermodynamiques des fluides au voisinage de l'état critique), C. Raveau. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 9, Aug. 30, 1920, pp. 471-473. Further proof of expressions given in Comptes rendus, vol. 171, 1920, p. 235, relative to isothermals and adiabatics in vicinity of critical point.

FLUMES

Prolonging Life of. Life of Flume Prolonged by Roofing Paper Lining. Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, p. 131, 2 figs. It is said that after other means of stopping a 50-per cent leakage had failed paper lining kept leakage below 10 per cent for five years.

FLUORESCENCE

Excitation of. A Study of the Line Spectrum of Sodium as Excited by Fluorescence, R. J. Strutt. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 272-286, 9 figs., partly on supp. plate. It was found that excitation of sodium vapor by second line of principal series led to emission of both 3303 and D lines.

Conditions of Excitation of Fluorescence (Conditions d'excitation de la fluorescence), L. Bruninghaus. Radium, vol. 11, no. 9, July-

Aug. 1919, pp. 262-265, 1 fig. Result of experiments.

Phenomena of. Conditions of Excitation of Fluorescence (Sur les conditions d'excitation de la fluorescence), L. Bruninghaus. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 531-534. From experiments it is concluded that phenomena of phosphorescence and fluorescence are characterized by property that intensity of luminosity is maximum when solution is highly diluted and exciting radiation very feebly absorbed.

X-Ray. The X-Ray Fluorescence of Certain Organic Compounds, H. S. Newcomer. Jl. Am. Chem. Soc., vol. 42, no. 10, Oct. 1920, pp. 1997-2007. Results of experimental observations.

FLYING BOATS

Aeromarine Model 40. The Aeromarine Model 40 Flying Boat, Paul G. Zimmermann. Aviation, vol. 7, no. 12, Jan. 15, 1920, pp. 526-528, 6 figs. Boat is pusher biplane of unusually sturdy construction. Characteristics are: Overall height, 12-ft. 7-in.; overall length, 28-ft. 11 3/16-in.; weight, full load, 2772 lb.; engine, aeromarine B-8 or L-6D of 130-hp.

Beardmore Amphibian. Beardmore 10 Passenger Amphibian Flying Boat, W. B. 9. Aeronautics, vol. 19, no. 357, Aug. 19, 1920, pp. 147-149, 4 figs. Dimensions: Span, 107 ft.; overall length, 61 ft.; extreme height, 20 ft. 6 in.; total weight, 14,000 lb.; wing area, 2202 sq. ft.; speed on ground level, 93 m.p.h.; at 10,000 ft., 82 m.p.h.; climb to 10,000 ft., 38 min.; ceiling, 11,000 ft.

Commercial Use. Flying Boats, W. T. Blake. Aeronautics, vol. 17, no. 316, Nov. 6, 1919, pp. 428-429. Their prospects for commercial purposes.

Design. Flying Boats—The Form and Dimensions of Their Hull, G. S. Baker. Shipbuilder, vol. 22, no. 117, May 1920, pp. 345-349, 3 figs. Curves showing effect of hull dimension on power required to overcome water resistance, sketches of typical hulls and efficiency curves for various types.

Flying-Boats, G. S. Baker. Flight, vol. 12, no. 11, Mar. 11, 1920, pp. 299-301, 1 fig. Table indicating variation of maximum power with hull beam for machines of 10,000 lb. total displacement.

Dornier. The Dornier Giant Flying Boats, Eric Hildesheim. Aviation, vol. 8, no. 11, July 1, 1920, pp. 432-434, 6 figs. Details and illustrations recently released for publication by U. S. Army Air Service, showing various types of Dornier flying boats built by the Zeppelin works.

Efficiency. Flying-Boats, G. S. Baker. Flight, vol. 12, no. 12, Mar. 18, 1920, pp. 319-321, 6 figs. Resistance and efficiency curves for various types, also table showing comparison of model estimate and actual results.

Gosport. Some Gosport Flying Boats for 1920. Flight, vol. 11, no. 52, Dec. 25, 1919, pp. 1657-1658, 4 figs. Description of medium-sized flying boat known as G-5.

The Gosport Flying-Boats. Aerial Age, vol. 10, no. 2, Sept. 22, 1919, pp. 53-55, 12 figs. Types range from large 10-seater of over 100-ft. span to very small single-seater of only 23-ft. span. Specifications of each type are quoted.

Hulls. Flying Boats—The Form and Dimensions of Their Hull, G. S. Baker. Trans North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, pt. 6, April 1920, pp. 269-288 and (discussion) 289-314, 3 figs. Also in Flight, vol. 12, no. 10, Mar. 4, 1920, pp. 270-272, 1 fig. and Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 323-327, 6 figs. Development of speed in transit in various cases and strategic and commercial value of aeroplane carriers considered. Dynamic requirements of hull given and considered in detail under headings of diving at low speed and seaworthiness, and ability to change trim at high speeds. Comparison between results obtained in full-scale tests and similar results deduced from tank experiments; formula for calculating bending moments and maximum impact blows in connection with stresses on hull of float when moving in waves on water.

Notes on Flying Boat Hulls, Linton Hope. Flight, vol. 12, nos. 21, 22 and 23, May 20, 27 and June 3, 1920, pp. 546-548, 569-573 and 590-593, 19 figs. Also in Aeronautics, vol. 18, no. 344, May 20, 1920, pp. 396-399 and Aeronautical Jl., vol. 24, no. 117, Sept. 1920, pp. 495-497. Deals with method of designing flying-boat hulls and with estimation of weights and proportions. Paper read before Royal Aeronautical Society.

Notes on Flying Boat Hulls, A. R. Low. Aeronautical Jl., vol. 24, no. 116, Aug. 1920, pp. 440-460 and (discussion) pp. 461-471, 20 figs. Survey of developments in outline, weight, dimensions, etc.

Lioré and Olivier. Lioré and Olivier's Flying Boat. Aeronautics, vol. 18, no. 334, Mar. 11, 1920, p. 214, 1 fig. Specifications: Span, upper plane, 21.40 m. and lower plane, 23.10 m.; overall length, 13.50 m.; maximum height, 4.05 m.; weight empty, 2840 kg.; two 150 hp. Hispano-Suiza and one 250 hp. Salmson.

New York Show. Aeromarine Flying Boats at the New York Aero Show. Flight, vol. 12, no. 13, Mar. 25, 1920, pp. 339-340, 3 figs. Dimensions: Span, top, 48 ft. 6 in.; span, lower, 37 ft. 8 in.; chord, both, 6 ft. 3 in.; weight, fully loaded, 3225 lb.; useful load, 245 lb.; loading per sq. ft., 6.15 lb.; speed range, 44-75 m.p.h.; climb in 10 min., 2200 ft.; range of action, 3½ hr., or 250 miles.

Oertz. The Oertz Flying Boats. Aerial Age, vol. 11, no. 13, June 7, 1920, pp. 440-441, 4 figs. Series of flying boats designed and built by Oertz Works at Hamburg, Germany. Translated from Flugsport.

Schalk Hydromonoplane. The Schalk Hydromonoplane (Der Schalk-Wasser-Eindecker), H. Böckel. Luftfahrt, no. 1-2, Jan. 1920, pp. 17-18, 2 figs. Details of a model said to be perfect replica of the hydromonoplane of the Hansa & Brandenburg Works. A thin, oiled bond paper is used for covering, which, after receiving an enamel coating, is said to be absolutely waterproof; weight of model, 160 gr.

Supermarine. The Supermarine Flying Boats. Aerial Age, vol. 10, no. 15, Jan. 26, 1920, pp. 570-572, 8 figs. Specifications are: Span, 30.5 ft.; overall length, 26.3 ft.; maximum height, 10.6 ft.; engine, Hispano-Suiza, 150 h-p.; total weight of machine loaded, 2,326 lb.

U. S. Navy. The U. S. Navy HS-1L and HS-2L Flying-Boats. Flight, vol. 11, no. 49, Dec. 4, 1919, pp. 1550-1552, 5 figs. Difference between them is that latter model is 12 ft. greater in span than 1L and has larger rudder. Both are used for coastal patrol work.

Vought. The Vought Flying Boat, Model VE-10. Aviation, vol. 7, no. 7, Nov. 1, 1919, pp. 301-303, 4 figs. General specifications are: Overall length, 27 ft.; overall height, 10 ft. 5 in.; span upper wing, 36 ft.; span lower wing, 28 ft. 4½ in.; weight empty, 1330 lb.; weight loaded, 1950 lb.; climb, 2650 ft. in 10 min.; speed 80 miles per hr.

[See also SEAPLANES.]

FLYWHEELS

Equalizers. Recent Improvements in Flywheel Equalizers for Electric Conveying Plants (Neuere Schwungradpufferungen in elektrischen

Förderanlagen), W. Wolf. Kali, vol. 13, no. 23, Dec. 1, 1919, pp. 388-394, 8 figs. Details and illustrations of various devices recently patented.

Rolling-Mill. See ROLLING MILLS, Flywheels for.

FOODS

See DEHYDRATION.

FOODSTUFFS

Dehydration of. See PUMPS, Vacuum.

FOREIGN TRADE

Europe. The Industrial Outlook in Europe, Alexander Luchars. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 121-122. Conditions in machine tool business of principal European countries.

Language for. See ESPERANTO.

Machine Tools. The Foreign Trade Situation, W. LaCoste Neilson. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 125-126. Prospects of foreign trade in American machine tools in Europe.

[See also EXPORT TRADE.]

FOREMEN

Handling Men. A Practical Talk to Foremen, George D. Halsey. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 196-199. Fundamental principles of handling men.

Place in Industrial Management. The Foreman, Sanford E. Thompson. Bul. Taylor Soc., vol. 5, no. 1, Feb. 1920, pp. 43-46 and (discussion) pp. 46-48. Scientific management, it is observed, has given a definite place to foreman in industry and has clearly outlined his position with reference to the workman.

Place in Industrial Progress. The Foreman's Place in Industrial Progress. Eng. & Indus. Management, vol. 3, no. 18, Apr. 29, 1920, pp. 557-559. Deals with importance of foreman's part in industrial progress as "link" between manager and workers.

Qualifications. Qualifications for Foremanship, Charles W. Clark. Indus. Management, vol. 59, no. 3, Mar. 1920, pp. 199-202. Qualifications enumerated are force, idealism, positive personality, common sense, good health and unquestioned loyalty.

Responsibilities of. Field of the Foreman in Industry, Charles W. Clark. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 18-20. His responsibilities with relation to men placed under him.

Training of. Foremen that were Bosses are now Leaders, Arthur H. Young. Factory, vol. 25, no. 7, Oct. 1, 1920, pp. 1035-1037, 2 figs. Course for training foremen as developed by International Harvester Co.

How to Become a Successful Shop Executive, Paul R. Ramp. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 823-826. Sample working schedule for foundry foreman is suggested, and various types of workmen are classified and how to deal with them pointed out.

The Foreman and Industrial Democracy, John Calder. Iron Age, vol. 105, no. 14, April 1, 1920, pp. 951-954. Training of foremen to properly handle workmen is urged. Experience of Swift & Co. in this direction is related. Paper read before Soc. of Indus. Engrs.

The Foreman and His Development, Charles W. Clark. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 105-109. Course of training for foremen suggested.

Training the Foremen of Industry, Dudley R. Kennedy. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 67-70. Opinion is advanced that foremen must not only be taught and trained but that their knowledge of economic truth must become a part of themselves, so that they may transmit it to workers under their direction.

Training Foremen, John Calder. Factory, vol. 25, no. 3, Aug. 1, 1920, pp. 355-358, 3 figs. Method at plant of Swift & Co.

See also EMPLOYEES, TRAINING OF, Foremen.

FOREST FIRES

See FORESTRY, Forest Fires.

FOREST PATROL

Aeroplane. Airplane Patrol of the Forests, F. A. Elliott. Am. Forestry, vol. 26, no. 316, April 1920, pp. 206-208, 4 figs. Organization of patrol squadron for inspecting regularly 28,000,000 acres of timber, brush and cut-over land which constitute a fire risk in Oregon. Squadron is to consist of 18 planes, 180 men, from 30 to 40 officers, carrier pigeon lofts, and is to include photographic and radio section.

FOREST PRODUCTS

Research Work. The Forest Products Laboratory, Chester H. Jones. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, 757-764, 12 figs. Account of research in methods of mechanical application and mechanical derivatives of forest growths.

FORESTRY

Aircraft Uses in. See AIRCRAFT, Uses in Forestry.

Devastation, Prevention of. Forest Devastation: A National Danger and a Plan to Meet It. Jl. Forestry, vol. 17, no. 8, Dec. 1919, pp. 911-945. Report of Committee for Application of Forestry, Soc. Am. Foresters.

Forest Fires. Climate and Forest Fires in Northern California, S. B. Show. Jl. Forestry, vol. 17, no. 8, Dec. 1919, pp. 965-979. Data on relationship between climatic factors and forest fires, secured at Feather River Experiment Station in 1915, 1916 and 1917, in connection with study of rate of spread of fires as controlled by physical factors.

Mensuration. Alignment Charts in Forest Mensuration, Donald Bruce. Jl. Forestry, Soc. Am. Foresters, vol. 17, no. 7, Nov. 1919, pp. 773-801, 15 figs. Alignment form of graph is contrasted with that using rectangular coördinates and chart is found to be simpler in appearance, to be capable of quicker and cheaper construction and to facilitate interpolations.

National Program. A Policy of Forestry for the Nation, Henry S. Graves. Jl. Forestry, vol. 17, no. 8, Dec. 1919, pp. 901-910. A program of forestry for the nation should include, in opinion of writer, "action by the public through the Government and the States, action by land owners and operators, as the means of uniting the efforts of all for the achievement of a common purpose."

Use of Seaplanes in. The Use of Seaplanes in Forest Mapping, Ellwood Wilson. Jl. Forestry, vol. 18, no. 1, Jan. 1920, pp. 1-5. Experience of Ministry of Lands and Forests of Canada.

FORGE PLANTS

Canadian Plant. The Dominion Forge Plant at Walkerville. Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 96-101, 10 figs. Plant at present comprises group of 13 buildings on 10-acre tract of ground, 410 ft. wide by average of 800 ft. deep.

Dies for. See DIES, Forging.

Drop Forging. See DROP FORGING.

England. Abbey Works, Lincoln. Engr., vol.

129, no. 3356, April 23, 1920, pp. 422-424, 6 figs. partly on supp. plate. Plant and details of forge shop.

Equipment. Economic Considerations in Regard to the Selection of Forging Equipment (Wirtschaftliche Gesichtspunkte bei der Wahl von Schmiedeaggregaten), H. Schneider. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 2, 4 and 6, Jan. 15, 29 and Feb. 12, 1920, pp. 1-4, 12-15 and 20-24, 11 figs. Description and illustrations of steam hammers, steam hydraulic and pure hydraulic presses, with graphic charts showing kinetic energy stored in a hammer tup, pressure exerted by hammers of different sizes, maximum capacities, and operating costs of presses and hammers.

Forge Shops. A Heavy Forging Plant in Wisconsin. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1315-1319, 9 figs. Concerning enlargement of Allis-Chalmers Co. to meet Government's needs.

Allis-Chalmers Heavy Forging Plant. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 527-530, 7 figs. Equipped with 3000-ton hydraulic press, 1000-ton press and series of hammers. Attention is called to features of design which permit of future expansion of plant. Also in Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 533-536, 7 figs.

Builds Forge Shop in Pittsburgh. Iron Trade Rev., vol. 67, no. 5, July 29, 1920, pp. 298-300, 5 figs. Output, 800 tons monthly. Forges are made of nickel, nickel-chrome or carbon steel and are used for making automobile, tractor, railroad car and machine tool parts.

The Central Forge Plant in Detroit, A. W. Peterson. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 1-5, 8 figs. There are two main structures 600 ft. long and 70 ft. wide. Attention is called to location of equipment which is said to have been placed with a view to securing maximum production.

See also Canadian Plant.

Forging-Machine Development. Development of Forging Machine Work. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 66-67, 1 fig. Possibilities of forging machine development during 1919 are visualized.

Furnaces for. Power and Fuel Saving in the Forge Shop, F. J. Denk. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 433-436, 4 figs. Notes on design and construction of forge furnaces, with comparative study of oil and coal furnaces, and exposition of advantages and disadvantages of powdered coal.

Semi-Producer Furnace. Iron Age, vol. 105, no. 11, Mar. 11, 1920, p. 733, 2 figs. Used in combination with waste heat boiler at plant of Burke Steel Co., Rochester, N. Y., and consisting essentially of two forging furnaces, chambers of which are 8 ft. 8 in. long by 5 ft. 9 in. wide, with height varying from 2 ft. 6 in. to 3 ft. at front of skew. Describes conditions under which they operate.

See also FURNACES, HEATING, Forging Work; Revergen.

Heat Saving in. Where Electricity Is a By-Product. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 871-875, 11 figs. Exhaust steam from large number of steam hammers is used to generate electricity and heat feedwater for drop-forging plant at West Pullman, Ill.

[See also FORGING, Forge Shops.]

Heat Treating. See Heavy Work.

Heavy Work. Making and Heat-Treating Heavy Forgings. Machy. (Lond.), vol. 15, no. 379, Oct. 30, 1919, pp. 129-135, 11 figs. Examples of American practice in production of heavy gun ingots and forgings.

Hydraulic-Press. An Investigation of Various Forging Operations Carried out under Hydraulic Presses, Eugène Schneider. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 12, 36 pp., 12 figs. partly on 3 supp. plates. Schneider apparatus for recording times and pressures employed during forging, in relation to stroke. Designed by Forge Department of Creusot Works.

Machines for. Adaptability of the Forging Machine, F. H. Blakeslee. Am. Drop Forger, vol. 6, no. 3, March 1920, pp. 134-136. Uses of forging machine in commercial drop-forge plant are pointed out.

Nickel Steel. Data on Nickel Chrome Forging Failures, J. H. Andrew, J. N. Greenwood and G. W. Green. Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 569-576, 12 figs. Includes also illustrations showing manner of testing forgings.

Progress in 1919. Technical Advances in Forging During 1919, Henry Freeman. Blast Furnace & Steel Plant, vol. 8, no. 1, 1920, pp. 111-112 and 128, 3 figs. Important developments quoted are: Deep etching of test specimens to detect flaws and new type of heat-treating furnace.

Progress Since 1912. Progress in Forging Practice During Recent Years (Ueber die Fortschritte auf dem Gebiet der Eisenhüttenkunde in den letzten Jahren), K. Dornhecker. Zeitschrift für angewandte Chemie, vol. 33, nos. 32 and 36, Apr. 20 and May 4, 1920, pp. 96-100 and 106-111, 10 figs. Description of the most important foreign and domestic processes and inventions since 1912.

Pyrometer Uses in. Forging Temperatures and Rate of Heating and Cooling of Large Ingots, F. E. Bash. Blast Furnace and Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 561-565 and 573, 3 figs. Results of tests claimed to show that an optical pyrometer can be used to determine when an ingot is ready to forge.

Railway Work, England. Railroad Forge Work in England, C. J. Bowen Cooke. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 57-63, 8 figs. Equipment and work done at London & Northwestern Co.'s Shops.

Research in. See RESEARCH, Forging Industry.

Selecting Materials. Relationship of Laboratories to Forge Shops, R. T. Bayless. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 30-35, 6 figs. Selection of proper materials by laboratory methods is exemplified and importance of laboratories in obtaining better products is discussed.

Standardizing Forging Limits. Data on Standardizing Forging Limits, W. F. Rockwell. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 49-50. It is claimed that present methods cause variations in quotations. Need for standardizing forging methods is set forth.

Steam-Hammer Work. Forging Round and Shaped Pieces under the Steam Hammer, A. S. Hesse. Am. Mach., vol. 52, no. 4, Jan. 22, 1920, pp. 185-188, 18 figs. Illustrates effect on stock of different methods of forging.

Stock Control. How to Save Stock in the Forge Shop, E. T. Lanham. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 1009-1010, 4 figs. System of stock control employed in Univ. of Ill. shops.

Swaging-Hammer. Forging with the Swaging Hammer. (Das Schmieden unter dem Reckhammer), F. Klages. Motorwagen, vol. 23, no. 13, May 10, 1920, pp. 223-224, 5 figs. Gives examples of drawing points, forging balls, handles, etc.

Upsetting Machine Dies. The Design of Upsetting Machine Dies. Mech. World, vol. 67, no. 1722, Jan. 2, 1920, pp. 2-3, 1 fig. Illustrates set of heading tools and dies for production of mild-steel collars.

FORGINGS

Cost Estimating. Purpose of Estimating the Cost of Forgings, Chas. F. Scribner. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 393-396, 2 figs. Manner in which estimates are prepared in large commercial forging shops operating on basis of scientific management.

Defective. Physical Defects of Steel in Forged Pieces (Les défauts physiques de l'acier en pièces forgées), A. Portevin. Revue de Métallurgie, Supplement number, 1918, 23 pp., 40 figs., partly on 15 supp. plates. By physical defects is understood any discontinuity in metallic mass visible to naked eye or by means of lens. Such discontinuities are classified and illustrated and significance of each is discussed and suggestions are given for preventing their formations.

Electric Heat Treatment of. Electric Heat Treating of Forgings. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 67-68, 4 figs. Operating results from 900-kw. two-unit automatic pusher-type electric hardening and drawing furnace.

FORTIFICATIONS

German, in Belgium. The German Defences on the Coast of Belgium, H. W. Miller. Mech. Eng., vol. 42, no. 6, June 1920, pp. 319-333, 28 figs. Description of system of fortification employed, together with particulars regarding guns, fire-control stations, shelters, etc., and details of mechanism of various batteries.

FOUNDATIONS

Bearing Value of Soils. Progress Report of the Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, pp. 905-941, 26 figs. Object of investigation was to ascertain whether laws of earth resistance and bearing value of soils admitted codification so as to furnish basis for standardization of practical design, and to plan researches with that object in view. Conclusion is that such codification cannot be based on purely frictional theory of earth resistance such as Coulomb and Rankine theories, but must be based on theory of elastic equilibrium with frictional equilibrium as limiting state determining discontinuities of field. Work was done in coöperation with Bur. of Standards.

Caissons. Deep Substructure of Assay Office Built in Quicksand by Caisson-Inclosed Method, T. Kennard Thompson. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 165-169, 6 figs. Excavation for vault to depth of 30 ft. below groundwater surface in quicksand district of New York City is said to have been carried out successfully inside caisson cofferdam. Joints were sealed by stock ramming.

See also CAISSONS.

Footings. Flat Foundations—Concrete, Reinforced Concrete, Masonry, etc. [Étude sur les fondations par empattements (Béton, béton-armé, maçonneries, etc.)], Aimé Willame and Henri Chenu. Annales des Travaux publics de Belgique, vol. 21, no. 2, Feb. 1920, pp. 7-81, 26 figs. Mathematical study of stresses. Stresses developed at bottom of massive base are computed approximately from theory of flexure.

Footings for Foundations (Étude sur les fondations par empattements), Aimé Willame and Henri Chenu. Annales des Travaux Publics de Belgique, vol. 21, no. 3, June 1920, pp. 391-446, 16 figs. Exemplification of design formulæ.

Load Pressure. Doubly Eccentric Load Pressure on Rectangular Footings, Marshall G. Findley. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 494-495, 2 figs. Diagram for computing pressures on doubly eccentric footings.

Machinery. See MACHINERY, Foundations for.

Power Houses. Power House Foundations, E. M. Lurie. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 167-173, 7 figs. Suggestions in regard to testing soils, methods of compacting, column footing, and draining.

Settlement. Report on Cause and Correction of Foundation Troubles of Box Factory at Natchez, Mississippi, C. E. Smith. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 4, April 1920, pp. 619-639, 10 figs. Following completion of plant, settlement occurred in foundations under practically all buildings and machinery. Trouble was found to be due to softening of top of 20 ft. of soil by water that could not escape through impervious blue clay under it. Correction was effected by excavating trenches through top soil to blue clay, installing porous tile and wood box drains and back-filling trenches to surface with cinders and gravel containing large percentage of sand.

Testing Subsoil. Foundations, Their Selection, Design and Construction. Am. Architect, vol. 117, no. 2314, April 28, 1920, pp. 533-536, 4 figs. Design of platform is suggested for testing soil bearing.

Three-Column. Analysis of the Continuous Three-Column Foundation, Charles A. Ellis. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 680-682, 5 figs. Distribution of base pressure controlled by continuity of main grillage girders. How correct lengths of girder projections are computed. Special case of limited projection.

Underpinning Methods. Underpinning and Foundations of Heavy Buildings. Engr., vol. 129, no. 3365, June 25, 1920, pp. 639-642, 12 figs., and vol. 130, no. 3367, July 9, pp. 25-27, 10 figs. Methods of underpinning walls used at various New York and Chicago buildings.

Uniform Pressure on Beds. Uniform Pressure on Building Foundation Beds, R. Fleming. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 219-223. Review of practice and code provisions, with numerical comparisons for typical office buildings, followed by recommended specification.

Unstable Sands. The World's Most Modern Pipe Plant, Francis Judson Tietsort. Compressed Air Mfg., vol. 25, no. 4, April 1920, pp. 9599-9602, 9 figs. Structures were built upon unstable water bearing ground situated under water and exposed to action of wind and tide. Sandy bottom under from 14 to 25 ft. of water of Lake Michigan was reclaimed. Steel encased concrete pillars were used.

[See also EARTH, Slides.]

FOUNDING

See CORE OVENS; CORES; CUPOLAS; FOUNDRIES; IRON CASTINGS; MOLDING MACHINES; MOLDING METHODS; PATTERNMAKING; PATTERNS; STEEL CASTINGS; etc.

FOUNDRIES

Aluminum-Castings. Modern Foundry for Aluminum Castings, F. L. Prentiss. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 535-539, 10 figs. System of conveyors for handling castings as well as sand installed at plant of Aluminum Manufacturers, Inc.

Attractions for Apprentices. Past, Present and Future of the Iron-Founding Industry, H. L. Reason. Foundry Trade Jl., vol. 21, no. 216, Dec. 1919, pp. 884-885, 8 figs. Establishment of conveniences in foundries so as to make them attractive to foundry apprentices.

Automobile-Cylinder. Plant for Casting Automobile Cylinders. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 23-26, 6 figs. Attention is directed to arrangement permitting molding machine to travel and equipment for handling sand from bins along side.

Automobile Industry. Build Foundry for Motor Industry. Iron Trade Rev., vol. 65, no. 19,

Nov. 6, 1919, pp. 1245-1247, 6 figs. In new Saginaw plant systematic arrangement of equipment and study of factors entering into production are said to have been made to obtain large tonnage of duplicate parts.

Brass. Builds Novel Foundry for Making Railway Brasses. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 866-868, 8 figs. Features of design intended to provide for economical operation and comfort of employees are specially noted. Foundry is that of Chesapeake & Ohio Railroad at Huntington, Va.

Investigation of Brass Foundry Fluxes, C. W. Hill, T. P. Thomas and W. B. Vietz. Min. & Metallurgy, no. 165, Sept. 1920, p. 18. Term foundry or casting fluxes refers to substances added to molten metals, preparatory to casting into molds or ingots, with object of removing small amounts of impurities. Authors are forced to conclusion that real action of such fluxes is physical in nature.

Measurement of Casting Temperatures in the Brass Foundry, John Arnott. Eng., vol. 110, no. 2852, Aug. 27, 1920, p. 277, 1 fig. Instruments employed. Advantages of measuring temperature for controlling quality of product. Paper read before Instn. British Foundrymen.

Reclamation of Metal from Brass-Foundry Refuse, F. L. Wolf and G. E. Alderson. Min. & Metallurgy, no. 165, Sept. 1920, p. 19, 2 figs. Gives actual costs and returns obtained in reclaiming plant used at Ohio Brass Co.

Using High Temperature Cement in the Brass Foundry, J. H. McPadden. Brass World, vol. 15, no. 10, Oct. 1919, pp. 319-320, 4 figs. Method for laying up brick in furnace wall.

Brass vs. Malleable Iron. Foundry Comparisons, H. G. Barrett. Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 738-743, 11 figs. Concerning different types of runners, and various operations in founding brass and malleable cast iron. Paper read before Lond. Branch of Instn. of British Foundrymen.

British Practice. Some Aspects of British Foundry Practice. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 873-874. Correspondent claims no notable improvements have apparently resulted from war activity. Great attention is being paid, it is pointed out, to chill castings, with object of reducing subsequent machining operations to minimum.

Continuous. Continuous Shop is Highly Efficient, Pat Dwyer. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 625-630, 9 figs. Among advantages claimed to be derived from continuous foundries are increased tonnage from given floor space and limited flask equipment. Operation of continuous foundry of Air Brake Company, Wilmerding, Pa., for last 30 years is quoted as example.

Keeping the Foundry in Continuous Operation, John H. Eastham. Can. Foundryman, vol. 11, no. 3, Mar. 1920, pp. 63-65, 4 figs. Survey of practice in various Canadian shops.

Conveyors for. Conveyors Speed Foundry's Work, H. E. Diller. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp. 51-58, 11 figs. Sand conveyor located in middle of foundry supplies all molders with sand and carries used materials back to mixer.

Increased Foundry Production by Conveyors. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 831-833, 5 figs. Savings in time, space and materials, coupled with greatly increased production are said to have resulted from installation of system of conveyors in No. 2 foundry of Hamilton Foundry & Machine Co., Hamilton, Ohio.

Core Ovens. See CORE OVENS.

Cost Accounting. See COST ACCOUNTING, Foundries.

Cost Systems. See COST SYSTEMS, Foundry.

Costs. See COSTS, Foundry.

Cranes for. See CRANES, Foundry.

Cupolas. See CUPOLAS.

Design. Toledo Company Building New Plant. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 439-442, 6 figs. Particulars of design of foundry intended for castings ranging in weight from a few ounces to 50 tons.

Electricity in. Foundry Applies Electricity to Many Operations, H. R. Simonds. Foundry, vol. 48, no. 345, April 15, 1920, pp. 301-303, 5 figs. Steel foundry of Connecticut Electric Steel Co., Hartford, Conn., in which electricity is used for making steel, baking cores, annealing and heat-treating castings, and in cleaning room, as well as in melting and refining steel.

Equipment. Exhibits Show Trend in Design. Iron Trade Rev., vol. 67, no. 15, Oct. 7, 1920, pp. 1007-1011, 7 figs. Developments in model and construction of machine tools, molding machines, handling equipment and furnaces as evidenced by 225 exhibits shown in connection with meeting of Am. Foundrymen's Assn. at Columbus, Ohio.

Many Equipment Features in Hercules Foundry, Gilbert L. Lacher. Iron Age, vol. 106, no. 3, July 15, 1920, pp. 123-130, 15 figs. Plant is equipped with three 96-in. Whiting cupolas with total daily melt of 250 to 300 tons. Buda elevating trucks operated by storage batteries are used to transport cars for pig iron, scrap, coke and facing sand.

Old Firm Erects Modern Foundry. Foundry, vol. 48, no. 12, June 15, 1920, pp. 461-466, 11 figs. Equipment of foundry in Ohio in which a wide and varied line of punches, shears and other machinery employed in fabricating plates and shapes, is produced.

See also FOUNDRY EQUIPMENT.

Ford Motor Co. On the Move in the Ford Motor Co. Foundry, F. H. Bell. Can. Foundryman, vol. 11, no. 6, June 1920, pp. 156-157, 1 fig. Notes on molding machines and overhead sand hoppers, molding the pistons, cleaning castings, trucks used for conveying casting to machine shop, and cupolas and ovens. First of series of articles on production of castings for automobiles.

France, Rebuilding. I. H. C. Foundries in France Rebuilt, H. Cole Estep. Foundry, vol. 48, no. 5, Mar. 1, 1920, pp. 169-176, 18 figs. How casting shops in factory of International Harvester Co. near Lille have been reëquipped and again organized for operation after four years of war.

Increasing Output. Foundry Reduces Unit Cost of Manufacture, Gilbert L. Lacher. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 191-193, 1 fig. Piece-work system and improvements in material-handling methods and molding practice are said to have increased output per employee.

Innovations Increase Unit Output. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 599-607, 11 figs. General features of Saginaw Malleable Iron Co. discussed, and some examples of molding and coremaking procedure presented.

Quantity Production Methods for Increasing Foundry Output, W. S. Falstbeau. Metal Trades, vol. 11, no. 1, Jan. 1920, pp. 5-12, 23 figs. Description of pattern and foundry equipment which is said to have contributed to increased output of castings during war.

Industrial Trucks for. Cupola Metal Conveyed by Electric Trucks. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 827-830, 7 figs. Plant of Elmira Foundry Co. for small castings predominant feature is use of electric storage battery trucks for handling of molten metal and castings, electric traveling cranes being eliminated

with exception of one crane in cleaning department.

Labor-Saving Devices. Labor-Saving Foundry Innovations Planned, Edwin A. Hunger. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1031-1035, 4 figs. Among features of foundry being built by Lycoming Motors Corporation, Williamsport, Pa., maker of automobile engines, are mentioned carousel and apron conveyors and monorail system to facilitate casting of automobile motors, core-oven room ventilation, and unusual sandblast cabinet.

Magnetic Separation of Iron from Refuse. Magnetic Separation of Iron from Foundry Refuse from an Economic Standpoint (Ueber die Wirtschaftlichkeit der magnetischen Aufbereitung von Schutt und Schlacken in der Eisenund Stahlgiesserei), Hubert Hermanns. Giesserei-Zeitung, vol. 16, nos. 16, 17 and 18, Aug. 15, Sept. 1 and Sept. 15, 1919, pp. 244-248, 260-263 and 275-277, 13 figs. Illustrations and operating costs of traveling, portable and stationary separation plants are given. Traveling plants are said to have shown most satisfactory results in average works.

Malleable-Iron. Economies in a Malleable Iron Foundry, A. F. Conant. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 859-861, 5 figs. It is claimed good working conditions have been provided in annealing department of Rhode Island Malleable Iron Works, Hills Grove, R. I., by constructing building with unusually high roof; great economies are said to have been effected by concreting entire yard to depth of 6 or 8 in., except beneath stock piles.

Malleable Iron vs. Brass. See Brass vs. Malleable Iron.

Management. The Prime Factors of Foundry Efficiency, M. H. Potter. Metal Indus., vol. 17, no. 10, Oct. 1919, pp. 462-463. Advises "elimination of too large system" and "consolidation of necessary details."

Mechanical Handling in. An Achievement in Foundry Design, Gilbert L. Lacher. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 827-832, 13 figs. Busch-Sulzer structure in St. Louis. Attention is directed to equipment, transportation facilities, lighting, ventilation and sanitation.

Mechanical Handling of Foundry Material. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 870-871, 4 figs. It is stated that manual labor is replaced by cranes and hoists except in cupola charging in foundry recently installed by Vermont Snath Co., Springfield, Vt.

Microscope, Use in. The Use of the Microscope in Solving Foundry Problems, G. R. Bolsover. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 220, April 1920, pp. 279-285, 24 figs. Photomicrographs are presented and it is shown how structure of materials may be determined by analyzing them.

Mixing Metals. See New Apparatus.

New Apparatus. New Apparatus in the Foundry (Les nouveautés en fonderie). Fonderie Moderne, no. 9, Sept. 1919, pp. 212-215, 12 figs. Device permitting relining of converter without dismantling piping, process for mixing two metals which melt at different temperatures, and other patents.

Organization. New Foundry is Model of Efficiency. Foundry, vol. 48, no. 9, May 1, 1920, pp. 345-349, 7 figs. Organization of foundry at Cincinnati is said to permit maximum production with unskilled labor.

Organizing for An Increased Output, K. V. Wheeler. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 85-87, 4 figs. Experience of foundry company introducing molding machines in auxiliary equipment.

Organization in Non-Ferrous Foundries, O. Bertoya. Metal Industry (Lond.), vol. 16, no. 12, Mar. 19, 1920, pp. 225-229, 10 figs. Order cards, pattern registers and other foundry cards used at various English works, are illustrated.

Oxy-Acetylene Welding in. See OXY-ACETYLENE WELDING, Iron Foundry Work.

Piano-Plate. Piano Plate Foundry is Distinctive. Foundry, vol. 48, no. 11, June 1, 1920, pp. 421-425, 6 figs. Cupola is located in center of molding floor for convenience of molders carrying iron. All metal is poured from hand ladles. Shop drills and bronzes the castings.

Pouring Methods. Labor-Saving Methods in the Foundry, Peter F. O'Shea. Am. Mach., vol. 53, no. 17, Oct. 21, 1920, pp. 763-764. Methods of pouring used in different classes of work in factory of Chapman Valve Mfg. Co.

Reclaiming Metal from Sand. Reclaiming Metal Parts from Sand, George H. Manlove. Foundry, vol. 48, no. 11, June 1, 1920, pp. 426-428, 2 figs. Thorough screening with suitable magnetic means for removing iron objects from foundry sand is said to have resulted in considerable saving to several large foundries.

Sand-Handling Equipment. Modern Foundry Sand Handling Equipment, H. L. McKinnon. Metal Industry (Lond.), vol. 16, no. 5, Jan. 30, 1920, pp. 83-84, 2 figs. Use of rubber conveyor belt is recommended because it is said to possess smooth operating surface which cannot become impregnated with sand and which resists wear for long period.

Standardizing Work. See INDUSTRIAL MANAGEMENT, Foundries.

Steel. A Modern Steel Foundry. Automobile Engr., vol. 10, no. 138, May 1920, pp. 186-189, 15 figs. Description of foundry at Bliston, Staffordshire, England, which specializes in manufacture of automobile castings.

Designing a Model Steel Foundry, O. L. Merkt. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 100-102, 2 figs. Essentials of layout, equipment, arrangement and operation.

Examples of Practical Utilization in Founding Industry of Results of Physical and Chemical Tests (Exemples d'utilisation dans la pratique industrielle de la fonderie de fonte des résultats d'essais physiques et chimiques), J. Seigle. Fonderie Moderne, vol. 12, no. 5, May 1919, pp. 107-111, 13 figs. Graphs indicating physical properties of cast steel of various composition. From Bulletin de la Société de l'Industrie Minérale.

New Acid Steel Foundry at Alliance, Ohio. Iron Age, vol. 105, no. 7, Feb. 12, 1920, pp. 457-460, 5 figs. Attention is directed to method employed in conserving water supply and specially designed bearings used on cars for mold drying ovens.

Ohio Company Starts Steel Foundry. Foundry, vol. 48, no. 4, Feb. 15, 1920, pp. 146-150, 8 figs. Open-hearth situated at one end of main bay is said to facilitate straight-line production.

Plan Shop with View to Extensions. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 757-762, 9 figs. Steel foundry designed so that its present capacity can be more than quadrupled with little disturbance. Basic lining chosen for electric furnace. Castings conveyed in special boxes.

Steel Foundry Starts Operations. Foundry, vol. 48, nos. 5 and 6, Mar. 1 and 15, 1920, pp. 187-191 and 221-226, 16 figs. Mar. 1: Efforts made by Vulcan Iron Works, Wilkes-Barre, Pa., to reduce operating expense. Mar. 15: Attention is directed to method of adjusting annealing furnaces at foundry of Vulcan Iron Works by lowering or building up side wall on which covers rest.

Transportation Is Factor in Increasing Out-

put of Steel Foundry, H. E. Diller. Iron Trade Rev., vol. 67, no. 12, Sept. 16, 1920, pp. 774-779, 11 figs. Inter-department transportation system in operation at plant of foundry of Fort Pitt Steel Casting Co., McKeesport, Pa.

Tensile Tests in. Position of Tensile Tests in the Foundry, W. A. Gibson. Iron Age, vol. 105, no. 11, Mar. 11, 1920, pp. 725-728, 2 figs. Value of tensile tests is said to lie more in checking metal-melting and molding practices than in assisting design. It is suggested that methods of testing different castings be standardized in order that results obtained in different foundries may be compared or that tests made one day may be compared with those made at another time. Special reference is made to aluminum work.

Testing Machines in. See TESTING MACHINES, Foundry.

Time Study in. See TIME STUDY, Foundries.

Welding, Applications of. The Welder in the Iron Foundry, David Baxter. Acetylene Jl., vol. 21, no. 9, Mar. 1920, pp. 597-600, 2 figs. Directions for saving "mis-run" castings with oxy-acetylene welder.

[See also ELECTRIC FURNACES, Steel Foundry; MOLDING MACHINES; MOLDING METHODS; PATTERNS; SAND BLAST; SAND, MOLDING.]

FOUNDRY EQUIPMENT

Steel Flasks. Fabricating Steel Foundry Flasks, J. D. Knox. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 631-634, 15 figs. Also in Iron Trade Rev., vol. 67, no. 5, July 29, 1920, pp. 305-308, 15 figs. Rigidity is obtained by forming ribs on 3-in. centers. Bottom half of each rib is made shallow to provide shoulder upon which sand rests. Diversified uses of flasks.

[See also CORE BOXES; CORE OVENS; SAND BLAST.]

FOUNDRY SUPPLIES

Clays. See CLAYS, Foundry.

FRACTURE

Mechanism of. Reliability of Materials and Mechanism of Fractures, Charles de Freminville. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 207-212, 21 figs. Lines of fracture in broken pieces of steel, glass, bitumen, etc., are analyzed. It is indicated how by study of such lines of fracture it is possible to explain discrepancy between properties of material as determined by test and as revealed by practice. Opinion is advanced that equal general law governs fracture of all materials.

FRAMES

Rigid, Calculation of. Calculation of Rigid Frames, V. Elmont. Concrete & Constructional Eng., vol. 15, no. 6, June 1920, pp. 380-385, 22 figs. Writer shows how calculation of statically indeterminate structures can be approached from another standpoint than that of theory of elasticity and carried out on basis of elementary laws and formulæ of mechanics. For sake of reference and comparison, a summary of horizontal thrusts and fixing moments for fixed frames under same loads as given for hinged ones, is presented in illustrations.

Rigid, Eccentrically Loaded. Eccentric Loading in Rigid Frames, F. E. Richart. Eng. News-Rec., vol. 84, no. 7, Feb. 12, 1920, pp. 331-332, 4 figs. Explains how fundamental frame formulæ may be applied when columns of frame have loads applied eccentrically.

Stresses in. Graphical and Mechanical Analyses of Frames, F. E. Richart and W. M. Wilson. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, pp. 700-702, 7 figs. Examples of graphical and mechanical methods of analyzing stresses in rigidly connected frames and continuous beams are presented along with a few applications.

FRAMING

Vertical-Load Moments. Moments in Columns and Girders of Building Frames Due to Vertical Loads, W. M. Wilson and F. E. Richart. Eng. & Contracting, vol. 53, no. 4, Jan. 28, 1920, pp. 93-94, 5 figs. Illustrates with example cumulative effect of loads on number of panels of building.

FREEZING TANKS

See ICE PLANTS, Freezing Tanks.

FREIGHT CARS

See CARS, FREIGHT.

FREIGHT HANDLING

Army Supply Base, Newark, N. J. Port Newark Terminal's Freight Handling Record, Wm. Van C. Brandt. Freight Handling & Terminal Eng., vol. 6, no. 1, Jan. 1920, pp. 23-27, 10 figs. Organization and operation of army supply base at Port Newark, N. J.

England. Freight Handling in England as Applied to Our Home Problem, F. T. Chambers. Pacific Marine Rev., vol. 17, no. 4, Apr. 1920, pp. 53-56 and 104-106, 7 figs. Address delivered before Material Handling Mach. Manufacturers' Assn., with illustrations from author's report published by U. S. Shipping Board.

Equipment, Cincinnati. Expediting the Movement of L. C. L. Freight. Ry. Age, vol. 69, no. 6, Aug. 6, 1920, pp. 219-222, 7 figs. Results being secured through handling of all trap car and interchange of less-than-carload freight in Cincinnati by motor trucks under system developed by Motor Terminals Co.

Equipment, Port of Seattle. Freight-Handling Equipment at the Port of Seattle, George F. Nicholson. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 37-39, 2 figs. Illustrates conveyors for stacking baled hay and sacked wheat, also 100-ton gantry crane.

Gattie System. See RAILWAY OPERATION, Freight Handling.

Marine Terminals. See TERMINALS, MARINE, Freight Handling.

Mechanical Methods. Electric Auto-Mechanical Freight Handling, Zenas W. Carter. Ry. Rev., vol. 66, no. 8, Feb. 21, 1920, pp. 282-284. Gattie system in London and Cincinnati schemes are outlined as typical of installations and possibilities of mechanical freight handling. Paper read before N. Y. R. R. Club.

Motor-Truck. Motorized Freight Transfer Cuts Terminal Costs. Eng. News-Rec., vol. 84, no. 11, Mar. 11, 1920, pp. 508-511, 7 figs. Operating results of installation of railroads at Cincinnati which provides mechanical handling of demountable truck bodies, and which is said to have practically eliminated the use of station trap cars.

Motorising Terminals, B. F. Fitch. Eng. & Indus. Management, vol. 4, no. 1, July 1, 1920, pp. 21-24, 4 figs. Economies in time and cost and increase in amount of freightage which can be handled are possible by use of motor transportation between and at terminals.

See also MOTOR-TRUCK TRANSPORTATION, Railway Freight Terminals.

Piers. Acceleration of Miscellaneous Cargo Movements at Ocean, Lake and Inland River Terminal Piers, H. McL. Harding. Pacific Mar. Rev., vol. 17, no. 6, June 1920, pp. 85-88, 4 figs. It is concluded that to obtain acceleration in speed of freight movements on a pier about 700 ft. in length preventing congestion with sheds for high tiering, pier should be from

140 to 160 ft. in width; there should be railway coördination between vessel and car by having not less than two railway tracks on each side of pier spanned by gantry jib cranes; in loading traveling gantry jib crane swings draft into ship's hold.

Railway Terminals. See TERMINALS, RAILWAY, Freight Handling.

Stacking Elevator for. Stacking Elevator Simplifies Freight Handling. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, p. 855, 1 fig. Self-driven electrical machine developed at Seattle.

[See also RAILWAY OPERATION, Freight Handling; TERMINALS, MARINE, Freight Handling.]

FREIGHT-HANDLING EQUIPMENT

See TERMINALS, MARINE, Freight-Handling Machinery.

FREIGHT TERMINALS

See TERMINALS, FREIGHT.

FREQUENCY

Changes of Measurement. On Some Experiments in which Two Neighbouring Maintained Oscillatory Circuits Affect a Resonating Circuit, J. H. Vincent. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 84-91, 4 figs. Experiments are described which provide means of observing small changes of frequency that have hitherto been studied by method of beats.

Meters. A New Frequency Meter for Weak Sound Currents (Ein neuer Frequenzmesser für schwache Tonströme), K. Wolff. Jahrbuch für drahtlose Telegraphie u. Telephonie, vol. 15, no. 4, Apr. 1920, pp. 321-326, 2 figs. Describes construction and manipulation of an apparatus for a measuring range of from 450 to 1200 vibrations per second, corresponding to a circuit frequency of about 2800 to 7500.

See also AMMETERS.

Standardization. Standardization of Frequency in Italy (Della Unificazione delle Frequenze in Italia), U. del Buona. Elettrotecnica, vol. 6, no. 26, Sept. 15, 1919, pp. 550-552. Value of 50 periods proposed as standard for whole of Italy by Committee of Associazione Elettrotecnica Italiana.

FREQUENCY CHANGERS

Induction-Type. The Induction-Type Frequency Changer, Harry S. Smith. Elec. Jl., vol. 17, no. 8, Aug. 1920, pp. 342-344, 5 figs. Simple explanation of theory of operation is given.

Researches. Researches on Frequency Transformers, Tsunetaro Kujirai. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 5, March 30, 1920, pp. 87-143, 30 figs., partly on 16 supp. plates. Theoretical and experimental investigations of no load cores, and load cores, and of conditions of maximum volt-ampere capacity and maximum efficiency. For a given magnetic induction and current density, volt-ampere capacity is found to be maximum when copper and iron spaces are so proportioned that copper space equals five-fourths of iron space, and under this condition of maximum volt-ampere capacity maximum efficiency is said to occur when iron loss per unit volume equals copper loss per unit volume.

Synchronous, Paralleling. Paralleling Synchronous Frequency Changers, Errol B. Shand. Elec. World, vol. 75, no. 11, Mar. 13, 1920, pp. 592-595, 7 figs. Five methods are outlined for control of load division between synchronous frequency-changer sets.

[See also RADIOTELEGRAPHY, Frequency Changers.]

FREQUENCY DOUBLERS

See RADIOTELEGRAPHY, Frequency Doublers.

FRICTION

Measurement of. Weighing of the Relative Friction Between Two Solids (La pesée d'un frottement pendant le glissement relatif des deux solides en contact), Jules Andrade. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 638-639. Suggested experiment.

Rolling, Photographic Measurement of. Photographic Measurement of Frictional Resistance to Rolling (Mesure photographique de la resistance au roulement), Jules Anirade. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 4, Jan. 26, 1920, pp. 225-226. Method is developed from Euler's problem of oscillations under action of gravity of cylinder within larger cylinder.

Static. Static Friction, W. B. Hardy. London, Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, no. 236, Aug. 1920, pp. 201-210, 2 figs. Experiments of static friction on glass faces. Chemical constitution and lubrication of bismuth.

Surface. New Facts About Surface-Friction, Ch. Terzaghi. Physical Rev., vol. 16, no. 1, July 1920, pp. 54-61, 2 figs. It is concluded from experiments that frictional resistance between two surfaces is not due to shearing strength of cushion on air or water, but to existence of microscopic particles that deposit themselves on rubbing surface.

FROZEN-MEAT INDUSTRY

Cold Storage and. See COAL STORAGE, Meats, Effect on.

Research in. The Method and Scope of Scientific and Industrial Research, with Special Reference to the Frozen Meat Industry, A. M. Wright. Cold Storage & Ice Assn. Proc., vol. 15, 1918-1919, pp. 147-155 and (discussion) pp. 156-159.

FRUIT INDUSTRY

Machinery for Canning, etc. Manufacture of Machinery for the Fruit Industry by the Anderson-Barngrover Company. Metal Trades, vol. 10, no. 12, Dec. 1919, pp. 537-539, 5 figs. Details in manufacture in canning, fruit-packing and fruit-drying machinery.

FUEL CONSERVATION

U. S. R. R. Administration. Work of the Fuel Conservation Section, Eugene McAuliffe. Ry. Age, vol. 67, no. 21, Nov. 21, 1919, pp. 1011-1013. How by securing coöperation without issuing orders fuel saving is said to have been effected by U. S. RR. Administration.

See also COAL, Conservation.

FUEL ECONOMIZERS

See ECONOMIZERS.

FUEL OIL

See OIL FUEL.

FUELS

Blast-Furnace Gas. See BLAST-FURNACE GAS, Use under Boilers.

Calorimeters. See CALORIMETERS.

Carbocoal. Artificial Anthracite Manufactured from Bituminous Coal, M. M. Brandegee. Manufacturers Rec., vol. 78, no. 5, July 29, 1920, pp. 101-104, 6 figs. Description of Government-owned plant at Clinchfield, Va.

See also COKE, Heating and Power.

Carbozite (Lignite Product). The Chemical

Utilization of Coal and the Improvement of Low-Grade Fuels (Die chemische Auswertung der Kohle und die Veredlung geringwertiger Brennstoffe), K. Theiler. Braunkohle, vol. 18, no. 32, Nov. 8, 1919, pp. 419-420. It is claimed that in low-temperature carbonization a method has been found for improving inferior fuels by chemical preparation, and that this points to the possibility of producing flaming coal (called carbozite) from lignites not adapted to production of briquets, and from peat.

The Low Temperature Carbonization of Low-Grade Fuels, Especially of Lignites (Die Tieftemperaturverkohlung geringwertiger Brennstoffe, insbesondere der Braunkohle), H. Theiler. Braunkohle, vol. 18, no. 33, Nov. 15, 1919, pp. 431-434, 2 figs. Notes on manufacture of carbozite, a lignite product whose heating value is three times that of lignite and which burns with a long clear flame and is practically smokeless.

Coal. See COAL; PULVERIZED COAL.

Coal, Oil and Sawmill Refuse. Sawmill Refuse, Powdered Coal, and Oil Fuels, Darrah Corbet. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 8, August 1920, pp. 715-732, 2 figs. It is said that "it will be necessary to curtail some of the further development in the use of oil fuel." Advantages of burning pulverized coal and possibilities of using sawmill refuse, are pointed out.

Coal vs. Oil. Coal vs. Oil Performance Chart, L. C. Lichty. Heat & Vent. Mag., vol. 17, no. 9, Sept. 1920, pp. 47-48, 2 figs. Chart for computing efficiency that may be expected in changing from one fuel to the other.

Coal Versus Oil Performance Chart. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 402-403, 2 figs. Chart for determining efficiency to be expected in changing from one fuel to the other.

Coke. See COKE.

Coke-Breeze Briquets. See COKE BREEZE, Briquets.

Colloidal. A Solid Fuel in Liquid Form, Robert G. Skerrett. Sci. Am., vol. 121, no. 25, Dec. 20, 1919, pp. 604-605, 4 figs. Advantages of combining solid and liquid fuels in colloidal form.

Colloidal Fuel, Lindon W. Bates. Can. Chem. Jl., vol. 41, no. 2, Feb. 1920, pp. 40-47. Nature of colloidal fuel, its development during war, results by trials, with review of its present and future general industrial possibilities.

Colloidal Fuel and Its Use, Lindon W. Bates. Chem. Engr., vol. 28, nos. 3 and 4, March and April 1920, pp. 73-77 and 125-127. Nature of colloidal fuel, its development during war, results of trials, with review of present and future general industrial possibilities. Paper read before Ottawa Branch, Canadian Section, Soc. of Chem. Industry.

When Oil and Coal Burn Together, Lindon W. Bates. Oil News, vol. 8, no. 6, Feb. 20, 1920, pp. 25-28, 1 fig. Exposition of theory and practice of burning colloidal fuel.

Colloil. "Colloil" Liquid Fuel. Colliery Guardian, vol. 119, no. 3097, May 7, 1920, p. 1287, 4 figs. According to described invention of G. Calvert, it is claimed that solid fuel need not be a colloidal suspension in liquid; it is maintained in suspension during handling or transference by agitation, and liquid acting as a vehicle need not be a fuel; when it is a fuel the agitation and means for handling or transferring mixture of solid and liquid fuels may be utilized to insure a properly proportioned mixture.

Comparative Costs. Comparative Cost of Fuels, M. Kinoshita. Dom. Eng. (Lond.), vol. 40, no. 20, Aug. 1920, pp. 123-124, 1 fig. Alignment chart indicating actual cost of obtaining 100,000 B.t.u. and 1 hp-hr. as mechanical energy from solid, liquid and gaseous fuel, and also electric energy, for given price, calorific value and efficiency.

Comparative Costs, Coal and Oil. Some Phases of the Fuel Problem, George A. Orrok. Elec. World, vol. 74, no. 15, Oct. 11, 1919, pp. 801-803, 3 figs. Comparative costs of coal and oil in heat equivalents and relation of prices of coal to price of oil in heat equivalent.

Economy. Fuel Economy. Chem. News, vol. 119, no. 310, Oct. 24, 1919, pp. 195-198. Committee report of British Assn. for Advancement of Science.

Fuel Economy. Engr., vol. 130, no. 3374, Aug. 27, 1920, pp. 196 and 198. Report of committee appointed for investigation of fuel economy, utilization of coal and smoke prevention, presented at meeting of Chemistry section, British Assn. for Advancement of Science. Among subjects discussed are future standards of gas supplies and alcohol from coke-oven gas.

See also COAL, Conservation; FURNACES, INDUSTRIAL; Fuel Economy in; STEEL MANUFACTURE, Fuel Economy in; FURNACES, METALLURGICAL, Fuel Economy in.

Evaluation of. Examination and Evaluation of Fuels on a Combustion-Temperature Basis (Beurteilung und Bewertung der Brennstoffe nach den Verbrennungstemperaturen), Wilhelm Schwier. Stahl u. Eisen, vol. 40, nos. 31, 33, 35 and 37, Aug. 5 and 19, Sept. 2 and 16, 1920, pp. 1033-1037, 1108-1111, 1170-1177 and 1236-1240. From determination of the combustion temperatures and values of a number of fuels, the influence of the combustion temperatures on capacity and fuel consumption of furnaces is established, and a general value coefficient for the determination and evaluation of fuels is recommended.

Exhaust Gases from. Calculation of Charts for Analysis of Exhaust Gases (Berechnung von Schaubildern zur Abgasanalyse), H. Seufert. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 27, July 3, 1920, pp. 505-507, 2 figs. For solid, liquid and gaseous fuels, formulæ are derived for calculation of charts, which consist of two superimposed systems of coordinates and with which it is possible to read two of the four quantities, CO_2, O_2, and CO content, and air factor, when the other two are given.

Heating Value. Heating Value of Fuels (Sur la valeur d'usage des combustibles), Emilio Damour. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1578-1581. Heating value is expressed as reciprocal of weights of two fuels which could produce the same thermal effect in a given furnace. A method is outlined for comparing effectiveness of various fuels in any case by means of that definition for heating value.

Lignite. Pulverized Lignite Fuel in California, Roy N. Buell. Chem. & Met. Eng., vol. 22, no. 13, Mar. 31, 1920, pp. 605-607, 2 figs. Results obtained at experimental plant were: Average evaporation per pound of dry fuel burned, 9 lb. of water from and at 212 deg. fahr.; average temperature in combustion chamber, 2300 deg. fahr.; average temperature of waste gases in breeching above boiler, 550 deg. fahr. Carbon dioxide content in waste gases, 14.5 per cent.

See also LIGNITE.

Liquid. Calorific Power of Liquid Fuels (Pouvoir calorifique des combustibles liquides), H. Décluy. Journal des Usines à Gaz, vol. 44, no. 13, July 5, 1920, pp. 195-196. Table of equivalents with coal.

See also Colloil.

Liquid, Ignition Temperatures. Spontaneous Ignition-Temperatures of Liquid Fuels, Harold

Moore. Jl. Instn. Petroleum Technologists & Rec. of Trans., vol. 6, no. 22, April 1920, pp. 186-211 and (discussion) pp. 211-223, 28 figs. Also in Petroleum Times, vol. 3, nos. 55 and 56, Jan. 24 and 31, 1920, pp. 101-103 and 123-124. Fuels measured by different experimenters are compared and results obtained by writer in similar experiments are quoted. Ignition points are listed for different mixtures of hydrocarbons.

Low-Grade. Production and Utilization of Low-Grade Fuels (Gewinnung und Verwertung minderwertiger Brennstoffe), A. Wirth. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 11, 12 and 15-16, Mar. 13, 20 and Apr. 17, 1920, pp. 245-248, 277-281 and 327-331, 41 figs. Includes description and illustrations of traveling, horizontal and hollow grates, and various types of grate bars for low-grade fuels.

Recovery and Utilization of Low-Grade Fuels (Gewinnung und Verwertung minderwertiger Brennstoffe), J. R. Trenkler. Annalen für Gewerbe u. Bauwesen, vol. 86, no. 6, Mar. 15, 1920, pp. 41-46, 6 figs. Points out that through a thermally favorable development of the processes for the drying and treatment of lignite and especially through an economic development in the artificial drainage of peat beds, a great saving can be effected in briquet factories. Address delivered before Assn. German Machine Engrs.

Lumber Refuse. Hog Fuel in the Pacific Northwest. Power, vol. 51, no. 18, May 4, 1920, pp. 709-712, 4 figs. Hog fuel is refuse from lumber made in process of manufacture into boards and pieces of larger dimensions. It consists of broken slabs and pieces broken from timber, sawdust and other forms. Performance results with hog fuel in plant of St. Paul & Tacoma Lumber Co. are included.

Mixed. Recent Patents on Mixed Fuels, W. R. Ormandy. Jl. Inst. Petroleum Technologists, vol. 6, no. 23, July 1920, pp. 229-239 and (discussion) pp. 239-248. Critical examination of patents granted by British Patent Office. Only minor details in patents, such as addition of denaturant to liquid fuel saturated with gas, are considered as novel, patents being described as mixtures of liquid fuels which every scientist knows will burn in almost any proportions.

Mixtures. Graphic Calculation of Mixtures (Graphische Mischungs-Berechnung), Wa. Ostwald. Chemiker-Zeitung, vol. 44, no. 38, Mar. 27, 1920, pp. 241-242, 3 figs. Describes graphical method applicable to calculation of hydrogen, carbon and oxygen content in fuel mixtures; production of gas or powder mixtures from a desired combination of raw materials; evaluation of solution mixtures, alloy mixtures, etc.

Oil. See OIL FUEL.

Peat. See PEAT; BOILER FIRING, Peat Fuel.

Pulverized Coal. See PULVERIZED COAL.

Research, British. Report of the Fuel Research Board for the Years 1918, 1919. Dept. Sci. Indus. Research, Lond., 1920, 57 pp., 5 figs. Account of survey of coals of Great Britain in particular as to suitability of different types of known origin for conversion into gases, fuel oils and coke, and also account of work undertaken with a view to obtaining thermal and economic data in connection with use of peat as fuel. Use of pulverized fuel in operations of various kinds is taken up and records are given of effects of purely meteorological conditions on natural draft of a chimney.

Sawmill Refuse. Burning Sawmill Refuse, Darrah Corbet. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 183-185, 1 fig. Comparison of wood-refuse fuel with fuel oil; how to determine when price for one is more economical than the other; tests of fuel using various methods of firing.

Supply, Limitations to. Present Fuel Supply from an Engineering Standpoint, H. M. Chance. Jl. Engrs. Club Philadelphia, vol. 36, no. 180, Nov. 1919, pp. 414-417. Calls attention to fact that while mines, equipment and coal resources are adequate to supply any possible demand, nevertheless ability of operator to mine is limited in part by labor shortage and principally by inadequate and irregular car service and by irregularity in purchases by consumers.

Tar. See DIESEL ENGINES, Tar Fuel.

Tar Oil. See FURNACES, BOILER, Tar-Oil-Fired.

Wood and Lignite as. Wood and Lignite as Fuels, R. E. Mathot. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 377-378. Comparative study of their value with that of peat.

Wood Waste. The Economy of Using Waste Wood for Heat and Power Generation in Woodworking Establishments (Die Wirtschaftlichkeit der Abfallholzverwendung zu Heiz, und Kraftdampf für Holzbearbeitungsbetriebe), M. A. Nüscheler. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, nos. 16 and 17, Aug. 31 and Sept. 15, 1919, pp. 125-128 and 135-138, 4 figs. Experience with boilers of Cornwall type, of comparatively long construction and having only one large flue in order to provide large heating surface.

[See also COMBUSTION; WOOD WASTE.]

FULMINATE OF MERCURY

See EXPLOSIVES, Fulminate of Mercury.

FUME

Precipitation of. A Modern Electrical Precipitation Plant. Cement, Mill & Quarry, vol. 16, no. 9, May 5, 1920, pp. 23-24, 4 figs. Description of an installation recently made in silver refinery of U. S. Metals Refining Co., Chrome, N. J., which is said to represent both successful commercial installation and advanced development of precipitating apparatus.

FUNCTIONS

Bessel-Clifford. The Bessel-Clifford Function and Its Applications, George Greenhill. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 501-528, 1 fig. Applications to such cases of equilibrium as that of uniform chain hanging vertically and vibrating slightly are presented with a view to show advantage of Clifford's notation.

Elliptic. See ELLIPTIC ELEMENTS.

Hermite. On the Number of Positive Hermite Functions of Given Discriminant in an Imaginary Quadratic Body (Sur la mesure de l'ensemble des classes positives d'Hermite, de discriminant donné, dans un corps quadratique imaginaire), G. Humbert. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 9, Sept. 1, 1919, pp. 407-414. Limiting value of fundamental equation deduced in C. R., vol. 169, 1919, pp. 309 and 360.

Holomorphous. Sequences of Holomorphous Functions (Sur les suites de fonctions holomorphes), J. Wolff. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 566-569. Theorems concerning conditions necessary and sufficient that limiting function should be holomorphous in same domain as functions of sequence.

Hyperbolic, Alignment Chart for. Alignment Chart for Circular and Hyperbolic Functions of a Complex Argument in Rectangular Coordinates, V. Bush. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 658-659, 1 fig.

Uniform, Formation of. Analytical Representation of Functions of Several Complex Variables (Sur la représentation analytique des fonctions de plusieurs variables complexes), M. Stoïlow. Comptes rendus des Séances d l'Académie des Sciences, vol. 169, no. 14, Oct. 6, 1919, pp

610-612. Based on application of Mittag-Leffler theorem on formation of uniform function of one variable from previously given singularities.

FURNACES

Air. See AIR FURNACES.

Annealing. See FURNACES, ANNEALING.

Annular. Starting the Annular Furnace (Das Anfeuern des Ringofens), Herman Hielscher. Tonindustrie-Zeitung, vol. 43, no. 82, July 15, 1919, pp. 733-735, 5 figs. Discussing iron and refractory grates.

Asphalt-Rock Distillation. Plant for Distillation of Asphaltic Rock at Ragusa (L'impianto di Ragusa per distillazione di roccie asfaltiche), Remo and Romolo de Bartolomeis. Industria, vol. 33, no. 20, Oct. 31, 1919, pp. 623-628, 9 figs. Particulars of furnaces.

Blast. See BLAST FURNACES.

Boiler. See FURNACES, BOILER.

Case-Hardening. See CASE-HARDENING, Furnaces.

Electric. See ELECTRIC FURNACES.

Forging. See FORGING, Furnaces for; FURNACES, HEATING, Forging Work; Revergen.

Glass. See GLASS MANUFACTURE, Furnaces.

Heating. See FURNACES, HEATING.

Heat-Treating. See FURNACES, HEAT-TREATING.

Hot-Air. See FURNACES, HOT-AIR.

Industrial. See FURNACES, INDUSTRIAL.

Laboratory. See Rosenhain.

Melting Metal Turnings. Furnace for the Continuous Melting of Metal Turnings. (Ofen zum ununterbrochen Einschmelzen von Metallspänen). Metall-Technik, vol. 46, no. 3-4, Jan. 20, 1920, pp. 10-11, 1 fig. Details of an arrangement in which the turnings are fed by their own weight into the molten metal through tubes projecting below its surface.

Metallizing. Utilization of Ontario Iron Ores, Reginald E. Hore. Can. Min. Jl., vol. 41, no. 39, Oct. 1, 1920, pp. 796-797, 3 figs. New metallizing furnace which gives hot product easily finished in electric furnace.

Metallurgical. See FURNACES, METALLURGICAL.

Open-Hearth. See OPEN-HEARTH FURNACES.

Oven, Specifications for. See GAS APPLIANCES, Specifications.

Reverberatory. See FURNACES, REVERBERATORY.

Roasting. See FURNACES, Roasting.

Rosenhain. Use of a Modified Rosenhain Furnace for Thermal Analysis, H. Scott and J. R. Freeman, Jr. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 348, 1919, pp. 317-323, 5 figs. Description is given of thermal analysis furnace constructed on principle of Rosenhain's furnace, chief departures from his design being, (1) use of gravity-drive rate control and (2) introduction of sample through bottom and cold end of furnace. Advantages and faults of these modifications are mentioned.

Temperature Measurements. Measuring Furnace Temperature, George K. Burgess. Iron Trade Rev., vol. 65, no. 19, Nov. 6, 1919, pp. 1248-1249. Solution of pyrometer problems is said to depend upon coöperation of steelmaker, scientific man in research laboratory and instrument maker.

Testing Instruments, Specifications. See GAS APPLIANCES, Specifications for.

Thermal-Analysis. See Rosenhain.

White-Metal Melting Furnace. The Carle Type of White-Metal Melting Furnace (Weissmetall-Vergiessungsofen, System Carle). Motorwagen, vol. 23, no. 11, Apr. 20, 1920, pp. 183-185, 4 figs. Account of a system developed by firm of Gottlieb Carle, Mannheim, with details and illustrations of a gas melting furnace, a furnace for preheating journal brasses prior to babbitting, and a furnace for melting babbitt out of old brasses, all equipped with pyrometers.

FURNACES, ANNEALING

Chantraine. The Chantraine Rotary Flame Pot Annealing Furnace. Eng., vol. 109, no. 2840, June 4, 1920, p. 754, 4 figs. Type of furnace which has been largely taken up in Belgium and is being introduced in several plants in England.

Doors. Heating Furnaces and Annealing Furnaces, W. Trinks. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 560-563, 15 figs. Difference in doors for annealing furnaces.

Evolution. Sheet, Pair and Annealing Furnaces, C. F. Poppleton. Iron Age, vol. 106, no. 13, Sept. 23, 1920, pp. 770-772, 2 figs. Evolution from earlier types to continuous pair furnace. Details of an in-and-out annealing furnace.

Present Status. Heating Furnaces and Annealing Furnaces, W. Trinks. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 71-73, 9 figs. Also in Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 118-121, 9 figs. Present status and future fields of improvement in industry.

Steel Castings. Formation of Structure of Iron by Solidification and Its Improvement by Annealing (Bildung des Gefüges beim Erstarren und seine Verbesserung durch Glühen des Eisens), F. Märtens. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 3, Feb. 1, 1920, pp. 41-45, 20 figs. Describes practical type of furnace for annealing low-carbon steel castings.

Stoker-Fired Tandem. Sheet, Pair and Annealing Furnaces, C. F. Poppleton. Iron Age, vol. 106, no. 12, Sept. 16, 1920, pp. 714-717, 2 figs. Typical tandem combination sheet and pair furnaces originally designed for use of producer gas and later changed to be stoker-fired. Pair hearth is flat and covered with specially corrugated tiles. It is arranged with two doors and pairs are charged to back and front of hearth alternately. Stoker is placed centrally on longitudinal center line of sheet and pair furnace with its combustion grates on either side of feeding worm.

FURNACES, BOILER

Air-Cooled Scraper Grate. Experiments with an Air-Cooled Scraper Grate (Versuche mit einem luftgekühlten Staurost), H. Kreyssig. Feuerungstechnik, vol. 8, no. 8, Jan. 15, 1920, pp. 69-71, 3 figs. Gives results of experiments with device installed at the discharge end of the Week traveling grates under the Stirling boilers of the Municipal Elec. Works of Reichenbach, showing its value when lignite briquets are employed as fuel.

Arches. Boiler Furnace Arches, W. C. Stripe. Combustion, vol. 2, no. 4, Apr. 1920, pp. 21-23, 3 figs. Ignition arches. Graphic method of determining number of straight and wedge-brick required for "sprung" arch.

Bagasse. Bagasse Furnaces, A. G. Budge. Int. Sugar Jl., vol. 22, no. 256, Apr. 1920, pp. 211-214, 4 figs. Types used in factories in Hawaii.

Combustion Control. Method and Apparatus for Controlling Combustion in Automatically-Stoked Furnaces (Méthode rapide et appareils de controle des foyers à chargement automatique), Marcil Chopin. Génie Civil, vol. 75, no. 18, Nov. 1, 1919, pp. 421-425, 3 figs. Schematic arrangement of Chopin system.

Design. Adaptation of Combustion Chamber to the Different Fuels and Influence of Radiation on Combustion (Appropriation de la chambre

de combustion aux différents combustibles et influence du rayonnement), P. Perdrizet. Chaleur & Industrie, no. 3, May 1920, pp. 163-172, 11 figs. Tests made to study influence of heat radiation on combustion in various types of boilers.

Developments in Furnace Installations for Solid Fuels (Neuerungen an Feuerungsanlagen für feste Brennstoffe), H. Pradel. Feuerungstechnik, vol. 8, no. 12, Mar. 15, 1920, pp. 101-105, 10 figs. A quarterly report of new furnace installations, including a sectional boiler for fuel rich in gas; a forced-draft furnace for marine water-tube boilers; draft regulator; forced-draft traveling grate; draft accelerator; etc.

Door Latch, Safety. De Waters Safety Latch. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, p. 803, 3 figs. Latch for boiler furnace door. It consists of L-shaped member pivoted at one end, weight on upper end of vertical length of L and latch base the movement of which is controlled by two level stop faces.

Low-Grade Fuels. Boiler Furnaces for Economical Utilization of Low-Grade Fuels (Feuerungsanlagen für Wärmesparwirtschaft bei Verwendung minderwertiger Brennstoffe). Der praktische Maschinen-Konstrukteur, vol. 53, no. 11, Mar. 18, 1920, pp. 83-90, 13 figs. Details of under-graduate blower arrangement for furnace with automatically stoked internally fired boiler, constructed by Germania Machine Factory, Chemnitz; the Topf self-feeding furnace for burning lignite; and traveling grates developed by the firm of C. H. Weck & Co., Dölau for use of low-grade fuels.

Utilization of Low-Grade Fuels in Boiler Operation (Verwertung minderwertiger Brennstoffe im Kesselbetrieb), Heinrich Reiser. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 30, 31 and 33, July 23, 30 and Aug. 13, 1920, pp. 225-227, 235-236 and 251-253, 9 figs. Notes on the various construction types of forced draft horizontal grates and traveling grates, with comparative tests. Recommendations for stoking with very low-grade fuels; gas film furnaces; traveling grates for flue boilers, extension and internal furnaces; the economy of gasification of coke breeze as compared with direct combustion under the boiler.

Oil-Fired. Fuel Oil for Boiler Furnaces, C. T. Baker. Refrigeration, vol. 26, no. 4, May 1920, pp. 34-35. Notes on furnace and combustion chamber, the oil burner and oil-burning equipment, oil storage tanks and heating arrangement.

See also OIL FUEL, Combustion of.

Progress. New Patents on Boiler Furnaces (Neue Patente auf dem Gebiete der Dampfkesselfeuerung), A. Pradel. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 28 and 29, July 9 and 16, 1920, pp. 209-212 and 219-221, 20 figs. Quarterly report of domestic and foreign patents.

Solid-Fuel. New Devices for Solid Fuel Furnaces (Neuerungen an Feuerungsanlagen für feste Brennstoffe), H. Pradel. Feuerungstechnik, vol. 7, no. 24, Sept. 15, 1919, pp. 189-193, 10 figs. Recently patented grates, a damper with thermostat regulations for boiler furnaces, a stoking device for locomotive fireboxes designed for Swedish locomotives, and other innovations are described and illustrated.

Tar-Oil-Fired. Construction and Operation of Tar-Oil Furnaces (Bau und Betrieb von Teerölfeuerungen), Rud. Reischle. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 22, Nov. 30, 1919, pp. 173-176. Brief description of properties of tar oil and account of different types of sprayers, followed by practical hints for the construction and operation of steam-boiler oil furnaces.

Safety Rules for Tar-Oil Furnaces (Sicherheitsvorschriften für Teerölfeuerungen). Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 17, Sept. 15, 1919, p. 139. Fourteen rules to avoid explosions.

Testing. See BOILERS, Testing.

Two-Stage. Two-Stage Combustion (La combustion en deux temps), Henry Dieterlen. Chaleur et Industrie, no. 4, July 1920, pp. 206-214, 17 figs. Boiler furnace said to have been developed from results obtained in extensive experimental researches of combustion. Furnace consists of four parts: Continuous furnace with mechanism for regulating proportions of fuel and air; first boiler element intended to cool gases to temperature near minimum at which they can be reignited; mechanism for thoroughly mixing cooled gases; second boiler element where exchange of heat takes place. Furnace is said to be capable of application to any type of boiler and for burning any fuel.

[See also DRAFT.]

FURNACES, ELECTRIC

See ELECTRIC FURNACES.

FURNACES, FORGING

Insulation of. The Value of Proper Furnace Insulation, A. W. Knight. Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 104-107, 4 figs. Advantages quoted for insulation are saving in fuel, increased capacity of furnaces, united control of temperatures, protection of outer walls and comfortable conditions about furnaces.

FURNACES, HEATING

Automatic. Automatic and Semi-Automatic Furnaces. Can. Machy., vol. 24, nos. 8 and 9, Aug. 19 and 26, 1920, pp. 178-183 and 198-199, 14 figs. Aug. 19: Typical furnace installations for various materials are shown and advantages of automatic heating discussed. Aug. 26: Examples of furnace installations.

Design. Heating Furnaces and Annealing Furnaces, W. Trinks. Am. Drop Forger, vol. 6, nos. 8 and 9, Aug. and Sept. 1920, pp. 379-382 and 455-457, 18 figs., also in Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 410-414, 12 figs. Factors affecting strength and durability of furnace; strength of iron and steel at furnace temperature; strength of fire brick; and forces in roofs and arches.

Forging Work. A Review on Designs of Forge Furnaces, H. B. Dempsey. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 22-24, 7 figs. It is emphasized that accurate temperature control is absolutely necessary to obtain best results in forge work.

Fuel Selection. Heating Furnaces and Annealing Furnaces, W. Trinks. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 539-543, 9 figs. Selection of fuel for a given furnace in conjunction with selection of equipment for its economical combustion. Natural gas as a furnace fuel. Also in Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 541-545, 7 figs.

Gas-Fired. Multi-Flame and Rotary-Flame Gas-Fired Furnaces. Iron and Coal Trades Rev., vol. 100, no. 2706, Jan. 9, 1920, pp. 40-41, 4 figs. Chantraine patent. It is built with double roof, space between two arches forming hot air chamber. Furnace is built with athermanous blanket of gas into which jets of hot air are directed.

Heating Furnaces and Annealing Furnaces, W. Trinks. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 583-585, 9 figs. Also Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 577-579, 9 figs. Economical use of by-product coke oven gas for heating and annealing furnaces.

Present Status. See FURNACES, ANNEALING, Present Status.

Producer-Gas-Fired. Heating Furnaces and Annealing Furnaces, W. Trinks. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 142-144, 5 figs. Discussion of use and application of producer gas in heating furnaces.

Progress in 1919. Heating Furnace Fuel Progress During 1919, A. E. Blake. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 121-124, 2 figs. Impetus given by fuel situation to study of more economical combustion methods.

Reheater. Coke Oven Gas Reheater Improvement, George B. Cramp. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 606 and 616, 2 figs. Increasing utility of reheater by application of radiator plates of corrugated sheets.

Reheating. Recuperative Furnaces for Re-Heating, N. R. Rees. Iron & Coal Trades Rev., vol. 100, no. 2709, Jan. 30, 1920, pp. 139-146, 1 fig. Types used for metallurgical purposes. Paper read before Staffordshire Iron & Steel Inst.

Revergen. The "Revergen" Forging Furnace. Eng. Production, vol. 1, no. 7, July 1920, p. 262, 2 figs. Describes improved regenerative system of gas firing, developed by The Davis Fuel Co., London, Eng., with which, it is claimed, considerable fuel economies are effected. Consists of an outer casing of sheet steel, bound by channels, tie rods, and thrust plates, body of furnace being composed of Scotch firebrick of extra thickness.

Rolling Mills. Experimental Study of Reheating of Metallic Pieces in Forging Furnaces (Études expérimentales sur le réchauffage des pièces métalliques dans les fours de forge), Felix Verdeaux. Revue de Métallurgie, vol. 17, no. 5, May 1920, pp. 312-334, 23 figs. Experiments with continuous and non-continuous furnaces with automatic and non-automatic grates, of type usually employed in rolling mills.

Strength. Heating Furnaces and Annealing Furnaces, W. Trinks. Am. Drop Forger, vol. 6, no. 7, July 1920, pp. 334-338, 11 figs. Factors affecting the strength and durability of the furnace; strength of iron and steel at furnace temperature; strength of fire brick; and forces in roofs and arches.

FURNACES, HEAT-TREATING

Carbonizing. Carbonizing Furnaces, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 4, Jan. 1920, pp. 206-213, 4 figs. Suggested form of construction.

Conveyor Type. Automatic Conveyor Furnace. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 642-643, 2 figs. Amco conveying furnace in which hearth does not leave furnace, minimizing heat loss.

Electric Heaters for. Electric Heaters for Heat Treating Furnaces—I, H. O. Swoboda. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 465-469, 10 figs. Also in Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 564-568, 10 figs. Review of various types, with notes on resistor materials and their properties.

Linings. See REFRACTORIES, Furnace Linings.

New Type. New-Heat Treating Furnace. Iron Age, vol. 106, no. 11, Sept. 9, 1920, p. 644, 2 figs. Similar to pusher type. It has no skid rails or other metal in floor, all beams being covered with fire tile. Manufactured by Advance Furnace & Eng. Co., Springfield, Mass.

Refractories for. See REFRACTORIES, Classification.

Rotary Hearth-Type. Rotary Oil-Fired Furnace of New Design. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1448-1450, 5 figs. Motor-driven hearth-type which makes one revolution for time required for carburizing. Results of trial operations are quoted.

Side-Opening. Side-Opening Heat Treatment Furnace. Iron Age, vol. 104, no. 26, Dec. 25, 1919, p. 1328, 2 figs. Furnace is equipped with movable partition walls and individually operated side doors in order to permit heat treatment of long shafts.

Stein and Atkinson. Modern Heat-Treatment Furnaces, The Stein and Atkinson Furnaces, N. R. Rees. Practical Engr., vol. 63, no. 1742, July 15, 1920, pp. 40-42, 5 figs. Principal feature is very great regularity of temperature, owing to special form of roof over hearth.

Tool Hardening. Drop-Stamping, Drop-Forgings, Etc., Joseph Horner. Mech. World, vol. 66, no. 1721, Dec. 26, 1919, pp. 307-308, 2 figs. Design of furnace for hardening milling cutters, dies, etc., of high-speed steel.

Types. Furnaces Used in Heat-Treating Steel. Machy. (Lond.), vol. 16, no. 411, Aug. 12, 1920, pp. 583-586, 6 figs. Comparison of types of furnaces used in carburizing, hardening and tempering.

[See also ELECTRIC FURNACES, Resistance Type.]

FURNACES, HOT-AIR

Coke Fuel for. See COKE, House-Heating Furnace Fuel.

Research. Report of Progress in Warm-Air Furnace Research, A. C. Willard. Univ. of Illinois Bul., vol. 16, no. 38, May 19, 1919, 68 pp., 22 figs. Investigation to determine efficiency and capacity of commercial warm-air furnace, satisfactory and simple methods for rating furnace, methods of increasing efficiency and capacity of furnace heating equipment, proper sizes and proportions of leaders, stacks and registers supplying air to various floors, and friction losses in cold air of recirculating ducts and registers.

Tests. A Report of Progress in Warm Air Furnace Testing at the University of Illinois, A. C. Willard. Jl. Am. Soc. Heating & Ventilating Engrs., vol. 26, no. 2, Mar. 1920, pp. 127-148, 13 figs. It has so far been found that warm-air furnace testing is "a question of true air-velocity and true air-temperature measurement and nothing else, as all other problems become insignificant when compared with these two."

Emissivity of Heat from Various Surfaces with Special Reference to Warm-Air Furnace Installations, V. S. Day. Univ. of Illinois Eng. Experiment Station, bul. no. 117, Jan. 1920, 39 pp., 10 figs. Results of comparative tests on covered and uncovered sheet metal surfaces made in connection with warm-air furnace investigation.

FURNACES, INDUSTRIAL

Fuel Costs. Fuel Consumption and Its Wastes as Affected by the Proper Use of Pyrometers and the Design of Furnaces, Claude S. Gordon. Jl. Am. Steel Treaters Soc., vol. 2, no. 5, Feb. 1920, pp. 241-250. Includes table giving relative and theoretical cost of energy in various fuels. Results of tests on three different nut stamping furnaces.

Fuel Economy in. Fuel Economy in Manufacturing Works, Chas. F. Wade. Eng. and Indus. Management, vol. 2, nos. 22 and 23, Nov. 27 and Dec. 4, 1919, pp. 675-678 and 717-720, 1 fig. Application of principles of scientific operation to gas-fired and coal-fired furnaces.

Gas-Fired. Drop-Stamping, Drop-Forgings, etc., Joseph Horner. Mech. World, vol. 66, no. 1716 and 1718, Nov. 21 and Dec. 5, 1919, pp. 246-247 and 271-272, 11 figs. Types of gas-fired furnaces.

Improvement in the Construction of Furnaces, Newton Booth and G. H. Roberts. Gas Jl., vol. 149, no. 2959, Jan. 27, 1920, pp. 188-

189. Experiments are related and from results obtained rules are formulated as guide for designing gas furnaces to work at high temperatures with "reasonably high thermal efficiencies." Paper read before Instn. Gas Engrs.

Oil Burners for. The Function of Oil Burners in the Operation of Furnaces, Henry J. N. Voltmann. Jl. Am. Steel Treaters Soc., vol. 2, no. 2, Nov. 1919, pp. 110-115 and (discussion) pp. 115-116. Observes that application of burners to existing furnaces without making proper provision in furnace brickwork to maintain conditions necessary for properly heating product, is in long run a waste of time.

Waste-Heat Utilization. Using Waste Heat from Industrial Furnaces. Metal Worker, Plumber and Steam Fitter, vol. 92, no. 15, Oct. 10, 1919, pp. 427-428, 2 figs. It is said that waste of heat can be stopped, expense of waste saved and increased service enjoyed everywhere if local heating engineer makes non-competitive business for himself by examining plants in his vicinity.

[See also HEATING, ELECTRIC, Industrial; PULVERIZED COAL, Metallurgical Furnaces; STEEL, HEAT TREATMENT OF, Furnaces.]

FURNACES, METALLURGICAL

Chantraine. Chantraine Polymultiple Flame Metallurgical Furnace (Fours métallurgiques a flammes polymultiples système Chantraine). Génie Civil, vol. 76, no. 14, April 3, 1920, pp. 336-337, 2 figs. Jet of air is blown into atmosphere of combustible gas, instead of gas flowing into air. Greater intensity of heat and perfect combustion are claimed as advantages.

Fuel Economy in. Fuel Control in Metallurgical Furnaces, Robert Hadfield and R. J. Sarjant. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 425-427, 4 figs.; also Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 589-594, 3 figs. Principles underlying economical use of fuel in metallurgical furnaces. Insufficiency of scientific data for effective determination of distribution of heat units in metallurgical furnaces is emphasized. Paper read before Iron and Steel Institute.

Governing Conditions. Metallurgical Furnaces, A. Bregman. Metal Industry (Lond.), vol. 14, no. 21, May 23, 1919, pp. 421-424, 7 figs. Conditions that govern size, shape, and type of metal-melting furnaces.

Guillem and Herrenschmidt. Modern Metallurgical Treatment of the Sulphides of Mercury, Zinc and Antimony and of the Arsenious Sulphides (Tratamiento metalurgico moderno de los sulfuros de mercurio, zinc y antimonio y de los arseniosulfuros), Manuel Abbad. Revista Minera, vol. 70, no. 2715, Dec. 8, 1919, pp. 605-607, 4 figs. Comparison of Guillem and Herrenschmidt furnaces.

High-Temperature Oil-Fired. A High-Temperature Oil-Fired Laboratory Furnace, H. K. Najarian. Eng. & Min. Jl., vol. 109, no. 26, June 26, 1920, p. 1413, 2 figs. Oil burner is of pan type. Oil is not atomized by mechanical means before it is ignited. Furnace is said to have been successfully used for melting and refining of nickel, and it is claimed that by proper manipulation furnace temperatures up to 1700 to 1800 deg. cent. can be obtained with it.

Non-Ferrous-Metal Melting. Melting Furnaces, Thomas H. A. Eastick. Metal Industry (New York), vol. 18, no. 7, July 1920, pp. 319-320. Some factors to be considered in selection of melting equipment for non-ferrous metals.

Pulverized Coal for. See PULVERIZED COAL, Metallurgical Furnaces.

FURNACES, REVERBERATORY

Anaconda Copper Co. Reverberatory Furnace for Treating Converter Slag at Anaconda, Frederick Laist and H. J. Maguire. Min. & Metallurgy, no. 157, section 13, Jan. 1920, 12 pp., 4 figs. Inside length of furnace, from burners to skimming block, is 153 ft. and inside width is 23 ft. 4 in. Pulverized coal is conveyed by 14-in. screw conveyor from coal-dust plant, a distance of 525 ft., and is delivered to 24-ton bin back of burners.

Heat Balance in. Balance of Heat and Matter in a Foundry Reverberatory Furnace (Stoff und Wärmebilanz eines Giessereiflammofens), R. Gnade. Stahl und Eisen, vol. 39, no. 22, May 29, 1919, pp. 590-595, 3 figs. Giving analysis of charge, of slag, of coal and flue gas; also temperatures of iron slag and furnace. Showing balance of matter of charge and of yield.

FURNACES, ROASTING

Cottrell Treater. Tooele Flue-Type Cottrell Treater, A. B. Young. Min. & Metallurgy, no. 162, June 1920, pp. 31-32, 1 fig. Apparatus installed at plant of International Smelting Co. for recovery of solids from gases from McDougall roasting furnaces. It consists of flue containing rows of vertical plates forming grounded electrode, alternated with rows of small horizontal pipes forming negative electrode, with proper provision underneath for taking away collected dust.

FUSAIN

See COAL, Fusain in Coal Dust; COAL MINES, Fires.

FUSION WELDING

Drop-Forging Work. Fusion Welding Applied to Drop Forgings, S. W. Miller. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 402-406 and 420-424. Oxy-acetylene and electric welds and their applicability to defective forgings. Effect of high temperatures on physical structure. Paper presented before Am. Drop Forge Assn.

G

GAGES

Brass Goods. Gauges and Standards for Manufacturing Brass Goods, P. W. Blair. Metal Indus., vol. 17, no. 10, Oct. 1919, pp. 460-462, 7 figs. Comparison of standards proposed by various scientific organizations.

Calibration. The Calibration of Dimensional Changes of Precision Gage Blocks, C. G. Peters and H. S. Boyd. Am. Mach., vol. 53, nos. 14 and 15, Sept. 30 and Oct. 7, 1920, pp. 627-632 and 674-679, 20 figs. Sept. 30: How planeness and parallelism errors of precision surfaces in gage blocks are determined; and Oct. 7: Comparison of gages by means of light waves. Tables and charts showing results of experiments.

Contour. See Indicating.

Future Development. Future of Gages in Manufacturing, Frank O. Wells. Indus. Management, vol. 59, no. 3, March 1920, pp. 193-196. Visualizes wide-spread use of gages in American industry and expansion of American foreign trade based upon their increased adoption.

Gage Blocks, Manufacture of. How Precision Gage Blocks are Made, Franklin D. Jones. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 697-708, 27 figs. Also Machy. (Lond.), vol. 16, no. 401, June 3, 1920, pp. 253-263, 27 figs.

Practice of Pratt & Whitney Co., Hartford, Conn.

Hardening. See Thread.

Hole, Limits for. Limits for Gauges for Holes. Engineer, vol. 128, no. 3331, Oct. 31, 1919, pp. 444-445. See also Machy. (Lond.), vol. 15, no. 370, Oct. 30, 1919, pp. 145, and Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 549-550. Reasons advanced by Newal Eng. Co., Walthamstow, in support of plus and minus hole limits. Presented in substantiation of contention that proposal of British Engineering Standards Assn. to make nominal size low limit for all holes will not be in best interest of all concerned.

Increasing Production with. See INDUSTRIAL MANAGEMENT, Production Methods.

Indicating. Indicating and Contour Gages, John E. Collins. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 732-736, 11 figs. Gages in which indications are read off by sight are divided into five classes, which with other unclassified gages are described.

Inspection. Precision Measuring and Inspection Devices, R. J. Whibley. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 135-139, 10 figs. Optical methods developed at British National Physical Laboratory, for facilitating inspection.

Standardized Inspection Tools. Pac. Mar. Rev., vol. 17, no. 1, Jan. 1920, pp. 108-111, 8 figs. Inspection tools and gages manufactured by Taft-Pierce Mfg. Co.

Use of Precision Balls for Accurate Measurements, R. L. Rankin. Machy. (Lond.), vol. 15, no. 374, Nov. 27, 1919, pp. 272-274, 7 figs. Attachments for machines and for taking direct measurements in inspection of gages. Practice of Gage Section of Bur. of Standards.

Interchangeable Manufacture. Gages in Interchangeable Manufacturing, Earle Buckingham. Machy. (N. Y.), vol. 26, nos. 11 and 12, July and Aug. 1920, pp. 1040-1046 and 1112-1117, 39 figs. Also in Machy. (Lond.), vol. 16, nos. 411 and 413, Aug. 12 and 26, 1920, pp. 576-582 and 637-642, 39 figs. Types of gages and gaging devices employed in manufacturing interchangeable parts.

Standardized Gages for Interchangeable Manufacture. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 624-626, 2 figs. Deals with modern inspection department practice and principles of gage design and includes tolerance system for gages designed especially for interchangeable manufacture.

Johansson. Johansson Angle Blocks and Other Precision Instruments. Am. Mach., vol. 51, no. 14, Oct. 2, 1919, pp. 669-670, 5 figs. Details and illustrations of some special precision instruments manufactured in Sweden to supplement blocks marketed by C. E. Johansson, Inc., New York City.

Lapping. Accurate Lapping, L. J. Vorhees. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 263-265, 3 figs. Instructions for gage lapping and for making laps.

Light-Wave Method of Measuring. Measuring Balls and Plugs by Light-Wave Method, H. L. van Keuren. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 14-16, 8 figs. Fundamental facts on which method of measuring plain cylindrical plug gages by interference bands produced by light waves is based.

Limit Plug. Quantity Production of Combination Limit Plug Gages. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 59-61, 4 figs. Description of new system of limit plug gages developed by Taft-Pierce Mfg. Co., and methods employed in their manufacture on quantity production plan. Limit plug gage made to this system consists of (1) gage handle, (2) "go" plug gage unit, (3) "not go" plug gage unit, (4) and (5) screws for holding gage units to handle. Principle advantage is possibility of interchanging gage units according to actual limits required in any one case.

Manufacture. Elements of Gage Making, C. A. McCready. Am. Mach., vol. 51, nos. 23 and 24, Dec. 18 and 25, 1919, pp. 1033-1036, and 1101-1103, and vol. 53, nos. 4 and 6, July 22 and Aug. 5, 1920, pp. 167-169 and 253-255, 22 figs. Common soldering acid should not be used when soldering gages to be worked. Knife-edge squares and straight edges necessary for good gage making. Removal of excess stock that creates error in plane or right-angle is said to be very quickly accomplished if error is truthfully located. Fixtures for grinding of radii to points of tangency. Use of sine bar as means to obtain greater degree of accuracy.

Gauge Making, A. G. Robson. Practical Engr., vol. 62, no. 1743, July 22, 1920, pp. 55-57, 18 figs. Discussion of different gages and different steps in their making.

Precision Gauges and Their Jigs, Arthur G. Robson. Engr., vol. 129, no. 3362, June 4, 1920, pp. 574-576, 28 figs. Describes methods adopted in manufacturing precision gages in which the tolerances may be as small as .0003 in., which are said to reveal interesting work and the correlation of calculations with workshop processes.

See also Interchangeable Manufacture.

Optical Flat. The Optical Flat—A Practical Measuring Tool, H. L. Van Keuren. Am. Mach., vol. 53, no. 3, July 15, 1920, pp. 107-112, 8 figs. Describes optical flat and its use for shop measurements.

Planer-Tool-Setting. Precision Type of Planer-Tool-Setting Gage. Machy. (Lond.), vol. 16, no. 414, Sept. 2, 1920, pp. 681-683, 4 figs. Tool-setting gage provided with Vernier for obtaining direct readings and with means for securing quick and accurate adjustments.

Plug. See Limit Plug; Snap.

Position. Position Gauges: Their Jigs, Construction and Calculations, Arthur G. Robson. Engr., vol. 129, no. 3346, Feb. 13, 1920, pp. 157-160, 23 figs. As example of calculations involved in manufacture of position gages, method of procedure in manufacture of gage consisting of circular boss and curved portion nearly semi-circular mounted on base is pointed out.

Precision-Ball, Inspection of. Use of Precision Balls for Accurate Measurements, R. L. Rankin. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 236-238, 6 figs. Practice of U. S. Bur. of Standards in use of precision balls as attachments for machines and for taking direct measurements in inspection of gages.

Ring. See Snap.

Screw. See Thread.

Serration. The Inspection of Serration Gages and Serrated Components, R. B. Dyer. Machy. (Lond.), vol. 14, no. 359, Aug. 14, 1919, pp. 589-590, 8 figs. Formulæ for checking broaches, cutters, tools, gages, etc. Form of serration considered is where spaces between teeth are sufficiently narrow in proportion to their depth to permit of measurement by means of wires.

Snap. Making Special Snap Gages, John Teckeer. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 83-85, 5 figs. Fixtures for grinding large and small snap gages so that they will not have to be remade on account of warping. Method of regulating pull of magnetic chuck is also given.

Snap, Plug and Ring Gages, J. E. Collins. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 212-218, 10 figs. Methods of construction, proportions, tolerances, etc. Article is based

upon practice of Gage Division of Ordnance Department during war.

Stellite for. Stellite, a New Gage Material, H. L. Van Keuren. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1045-1047. Results of investigations made demonstrate, it is claimed, that stellite is well suited for precision-gage reference standards of the better quality. It is believed that such a gage would be economical where it is necessary to use a reference gage at very frequent intervals or perhaps continuously.

Systems. The Use of Gauges in the Mechanical Field, E. C. Peck. Can. Machy., vol. 21, no. 23, Dec. 4, 1919, pp. 549-551. Origin of gages and description of principal systems in use.

Taper, Measurement of. The Measurement of Taper Gages. Inspector, vol. 2, no. 1, Dec. 15, 1919-Jan. 15, 1920, pp. 5-11, 9 figs. Methods commonly applied by Gage Section, U. S. Bureau of Standards, for measuring simple tapered plug, plug having double taper, plug having triple taper, taper ring gages and profile gages having tapered surfaces.

Taper, Profile and Concentricity. Taper, Profile and Concentricity Gages, John E. Collins. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 654-656, 6 figs. Details and illustrations of taper plug and ring gages, profile gages and male and female concentricity gages.

Thread. A New Form of Screw Gauge. Engineer, vol. 128, no. 3334, Nov. 21, 1919, pp. 508-510, 6 figs. Designed to measure both effective diameters and errors of pitch.

Hardening of Screw-Gauges with the Least Distortion in Pitch, Wilfrid J. Lineham. Mech. World, vol. 67, no. 1743, May 28, 1920, pp. 339-341, 16 figs. It is concluded that (1) hardening screw gages in oil, after casing in cyanide, can be performed with less distortion than if water is quenching medium; (2) temperature of 717 deg. (cent.) is best heat for quenching at; and (3) by screwing gages to accurate pitch and to diameters at two-thirds below high limit and one-third above low limit, lapping can be dispensed with.

Modern Methods of Screw Gage Production. Machy. (Lond.), vol. 15, no. 369, Oct. 23, 1919, pp. 121-124, 13 figs. Illustrating various specially designed single-purpose machines.

Screw Gage Making at Guildford. Engineer, vol. 128, no. 3329, Oct. 17, 1919, pp. 375-378, 14 figs. Machines and methods of testing.

Standard Thread Gages (Normal-Gewindelehrdorne), Jos. Reindl. Betrieb, vol. 2, no. 13, July 1920, pp. 313-315, 12 figs. States that with thread gages a cylindrical shank for measurements of the nut boring should suffice. The construction of thread gages with measurements of the Whitworth screw tap with center play is not feasible; for manufacture of accurate threads, standard thread gages do not suffice, special gaging devices being required for certain measurements.

The Hardening of Screw Gages with the Least Distortion in Pitch, Wilfrid J. Lineham. Am. Mach., vol. 53, nos. 12 and 13, Sept. 16 and 23, 1920, pp. 547-551 and 604a-604d, 28 figs. Also in Instn. of Mech. Engrs. Jl., no. 5, June 1920, pp. 451-478 and (discussion) 478-529, 40 figs. and Practical Engr., vol. 61, no. 1734, May 20, 1920, pp. 244-246, 2 figs. Paper in two parts, one devoted to water hardening and the other to oil hardening. Object of paper is to prove that quenching, while crossing an arrest or recalescence point, produces the least amount of distortion, and to give the results of the writer's tests. It is also shown that hardening screw gages in oil, after casing in cyanide, can be performed with less distortion than if water is the quenching medium.

The Manufacturer of Hardened Screw Gages. Engr., vol. 130, no. 3378, Sept. 24, 1920, pp. 310-311, 5 figs. Manufacturing process followed at plant of Coventry Gauge & Tool Co., Coventry, England.

Thread Gage Standards, J. E. Collins. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 427-433, 6 figs. System for thread plug and ring gages for U. S. standard threads.

See also Whitworth Thread.

Tolerances. Chart for Determining Fit Allowances, J. B. Conway. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, p. 17. Chart for determining tolerances and limits to be allowed for various classes of fits.

See also SCREW THREADS, National Screw Thread Commission; STANDARDS, Tolerances.

Tool-Setting. Precision Type of Planer Tool Setting Gage, Gustave Youngquist. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1121-1122, 4 figs. Tool-setting gage provided with vernier for obtaining direct readings and with means for securing quick and accurate adjustments.

Vertical Projection Apparatus. Vertical Gauge Projecting Apparatus; National Physical Laboratory. Eng., 109, no. 2826, Feb. 27, 1920, pp. 273-276, 14 figs. Standard type designed in National Physical Laboratory, England, Nov. 1917.

Whitworth Thread. Making Whitworth Thread Gages, C. Edgar Allen. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1157-1160, 5 figs. Method which utilizes disintegration of grinding wheel during grinding operation to produce final thread form.

[See also GAGE BLOCKS; MEASURING INSTRUMENTS, Universal; MICROMETERS.]

GALVANIZING

Continuous Furnace for. Continuous Sheet Galvanizing Furnace, A. E. Blake. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 124-125 and 128. Description of furnace installed at Apollo Steel Co., which is said to represent considerable fuel saving over previous furnaces.

English Practice. English Galvanizing Practice, A. J. Franklin. Metal Industry (N. Y.), vol. 18, no. 2, Feb. 1920, pp. 73-76, 2 figs. Advantages are claimed for British practice of using muriatic acid in preference to vitriol for pickling in zincing process. It is also noted that British government inspectors often specify cold galvanizing specially for important components in naval work.

Modern Practice. Modern Galvanizing Practice, A. J. Franklin. Metal Industry (London), vol. 16, no. 1, Jan. 2, 1920, pp. 7-9, 2 figs. Comparative strength of zincing, electrogalvanizing, sherardizing and metal spraying.

New Processes. New Galvanizing Processes (Galvanotechnische Neuerungen), H. Pradel. Elektrotechnischer Anzeiger, vol. 36, nos. 83 and 84, Aug. 10 and 12, 1919, pp. 387-388 and 393-394, 10 figs. Description of process for galvanizing hollow articles, electrolytes and electrodes, as well as inside and outside walls of pipes; process for galvanizing inner walls of small-sized sewers; apparatus for shaking off superfluous deposits while tinning, painting, etc.; and other processes recently patented.

Plant for. Galvanizing Plant Handles Large Work, A. H. Myers. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 181-187, 10 figs. Description of kettle of 100-ton spelter capacity which is gas- and coke-fired, with special reference to design and side-thrust braces.

Schoop Process. The Schoop Process of Mass Galvanization (Die Schoopsche Massenverzinkung). Autogene Metallbearbeitung, vol. 13, no. 1, Jan. 1, 1920, pp. 4-5. Description of metal-spraying process and apparatus for gal-

vanizing large quantities of articles in a very short time by entirely automatic operation.

Testing Coatings. A New Method of Testing Galvanized Coatings, Allerton S. Cushman. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 12 pp., 3 figs. Method depends upon placing on surface to be tested a tinned iron ring which is stoppered with soft-rubber stopper, thereby making a cell by means of which an hydrochloric acid-antimony chloride solution can be run on to the surface and resulting hydrogen formed by reaction of acid on zinc collected and measured.

[See also SHERARDIZING.]

GALVANOMETERS

Vibration Type. A New Form of Vibration Galvanometer, P. G. Agnew. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 158-161, 6 figs. Also in Sci. Papers Bur. Standards, no. 370, Mar. 12, 1920, pp. 37-44, 6 figs. Instrument consists essentially of fine steel wire mounted on one pole of permanent magnet and so arranged that free end of wire may vibrate between poles of an electromagnet through which current to be detected passes.

The Maximum Resonance of a Vibration Galvanometer (Das Resonanzmaximum beim Vibrationsgalvanometer), Konrad Gruhn. Archiv für Electrotechnik, vol. 8, nos. 6-7, Oct. 10, 1919, pp. 210-213, 3 figs. Discussion of and supplement to article by Zöllich in previous issue (no. 12, 1915), in which the differential equation of forced oscillation of the movable system in vibration galvanometers is worked out.

GARAGES

Concrete. Concrete Cantilever Construction in Chicago Garage. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 609-611, 3 figs. Single and double cantilever beams support 11-ft. span of floor and roof slab and carry 50-ft. monitor trusses.

[See also ARCHES, Reinforced-Concrete.]

GARBAGE COLLECTION

Trailers and Tractors. Garbage Collection by Trailer and Tractor, Stanley E. Bates. Mun. Jl. & Public Works, vol. 48, no. 2, Jan. 17-24, 1920, pp. 21-24, 3 figs. Explains how to calculate how many trailers, tractors, horses and men can be used to best advantage, and cost of service, giving illustrations of making such calculations.

GARBAGE DISPOSAL

Methods. Recovery of Valuable Constituents of Garbage, Samuel A. Greeley. Can. Engr., vol. 37, no. 22, Nov. 27, 1919, pp. 495-498. Summary of various methods of disposal of municipal wastes, including hog-feeding, incineration, sorting, reduction, alcohol production, etc. Paper read before Am. Soc. of Municipal Improvement.

See also Pig Feeding.

Pig Feeding. Pig Feeding for Disposal of Garbage, F. S. Besson. Mun. Jl. & Public Works, vol. 47, no. 21, Nov. 22, 1919, pp. 306-309, 4 figs. Results obtained at experimental farm operated by District of Columbia, and conclusions therefrom.

Recent Practice in Garbage Disposal by Feeding to Pigs. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 672-673. Committee reports submitted at convention of Am. Public Health Assn.

Waste Reclamation and. Garbage Disposal and the Economic Recovery of Valuable Constituents of Municipal Waste, Samuel A. Greeley. Mun. & County Eng., vol. 58, no. 1, Jan. 1920, pp. 22-26, 2 figs. Writer observes that garbage disposal should be considered with a view to economic recovery of valuable constituents, but he warns that lure of profit should not overshadow development of operation for convenience and comfort of householder and for economy of collection.

[See also REFUSE DISPOSAL.]

GAS

Blast-Furnace. See BLAST-FURNACE GAS.

Calorific Value. Advantages of a Reasonable Standard of Calorific Value for City Gas—Experiences in Canada, Arthur Hewitt. Am. Gas Light Assn. Monthly, vol. 2, no. 10, Oct. 1920, pp. 595-598, 1 fig. Minimum calorific standard of 450 B.t.u. was fixed by Canadian government as temporary measure in Nov. 1919, and was to be continued for a period of four months. Results realized are said to have been "most satisfactory to all interests concerned."

The Quality of Gas in Massachusetts. Gas World, vol. 73, no. 1888, Sept. 25, 1920, pp. 227-228. Calorific standard of minimum of 528 B.t.u. was established by Board of Gas & Elec. Light Commissioners in Dec. 1917. Encouraging results are being obtained. From official report of Board.

Cleaning. See GAS CLEANING.

Coal. See COAL GAS.

Coke-Oven. See COKE-OVEN GAS.

Combustion, Efficiency of. Principles of Gas Combustion, O. L. Kowalke. Jl. Western Soc. Engrs., vol. 25, no. 4, Feb. 20, 1920, pp. 113-123, 8 figs. Account of experiments conducted at University of Wisconsin with a view of determining relative efficiency of ordinary Bunsen combustion as it is practiced in most gas-fired furnaces and so-called surface combustion. It was found that with equal rates of gas consumption, rates of temperature-rise were practically the same in both cases.

Consumption, Estimation of. Estimating the Consumption of the Domestic and Industrial Fields, L. W. Alwyn-Schmidt. Am. Gas Eng. Jl., vol. 112, no. 26, June 26, 1920, pp. 501-502 and 510-511. It is pointed out that law of average in gas engineering is almost as free from error as in life-insurance business, and in writer's opinion, more attention should be given to statistical analysis. Factors that throw demand out of balance and how they should be corrected.

Distribution. See GAS DISTRIBUTION.

Illuminating. See ILLUMINATING GAS.

Industrial Applications. Gas in Relation to Industrial Production and National Economy, H. M. Thornton. Gas. Jl., vol. 149, no. 2966, Mar. 16, 1920, pp. 626-634, 11 figs. Examples of industrial applications of gas are quoted, such as gas-operated heat-treatment shop of motor works, "Rotoflam" tool-hardening gas furnaces, etc. Paper read before Royal Soc. of Arts.

Industrial Fuel. Gas in Relation to Increased Output and National Economy, H. M. Thornton. Jl. Royal Soc. Arts, vol. 68, no. 3517, Apr. 16, 1920, pp. 346-365 and (discussion) pp. 365-366, 17 figs. Notes on the application of gas to peace-time conditions, and contribution it has to offer to difficult problem of production confronting manufacturers. Writer gives examples of increased output as result of gas installation.

Preventable Fuel Loss in High Temperature Heating, Arthur L. Stevens. Combustion, vol. 2, no. 5, May 1920, pp. 24-26, 1 fig. Writer maintains the installation of gas apparatus and its application to industrial heating demands experience not found in average plant, and that in order to effect greatest saving in fuel consumption in industrial plants, it is necessary to make use of a higher class of

equipment both as to apparatus and operatives. Gives an example of saving in a recent installation.

Mustard. See GAS WARFARE, Mustard Gas.

Natural. See NATURAL GAS.

Producer. See PRODUCER GAS.

Recovery from Sewage Sludge. The Recovery of Gas from Sewage Sludge (Die Gaswewinnung aus Klärschlamm), H. Trautmann. Zeitschrift des Vereines deutscher Ingenieurs, vol. 64, nos. 5 and 6, Jan. 31 and Feb. 7, 1920, pp. 107-112 and pp. 134-136. Writer contends that the distillation of dry sludge is of no economic importance, as the ammonia obtainable therefrom is of too small value.

Research. Third Report of the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers. Gas Jl., vol. 150, no. 2978, June 8, 1920, pp. 592-603. Subject investigated was relative efficiency of using different grades of gas.

Fourth Report of the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers. Gas Jl., vol. 150, no. 2978, June 8, 1920, pp. 604-631, 11 figs. Description of Duddingston research station, and account of work there performed.

Uses, Heat Units Utilized. Note on the Thermal Efficiencies of Production, Distribution, and Use of Gas and Electricity, Dugald Clerk. Gas Jl., vol. 149, no. 2961, Feb. 10, 1920, pp. 294-296, 10 figs. Figures are given showing comparatively utilized heat units both by gas and electricity for heating, power and light services.

Water. See WATER GAS.

GAS ANALYSIS

Weight Buret for. A Weight Buret for Gas Analysis, E. R. Weaver and P. G. Ledig. Jl. Am. Chem. Soc., vol. 42, no. 6, June 1920, pp. 1177-1185, 2 figs. Apparatus for determining small quantities of gas by weighing confining liquid displaced is described and its percentage accuracy is shown to be comparable with general accuracy of good titrimetric measurements.

[See also INTERFEROMETERS, Gas.]

GAS APPLIANCES

Consuming Devices. Lack of Standard Performance Data Tends to Prevent Improvement in Efficiency of Gas-Consuming Devices. Am. Gas Eng. Jl., vol. 3, no. 18, Nov. 1, 1919, pp. 420-421 and 426. Report of Industrial Fuel Committee of Committee on Standard Performance Specifications for Gas Appliances of Am. Gas Assn.

Specifications for. Industrial Fuel Committee Report of Sub-Committee on Standard Performance Specifications for Gas Appliances, I. Lundgaard. Am. Gas Assn. Monthly, vol. 1, nos. 11-12, Nov.-Dec. 1919, pp. 627-633, 6 figs. Tentative proposal for standard specifications for oven furnaces and instruments for testing furnaces.

GAS CLEANING

Scrubbing Towers. The Theory of Gas Scrubbing Towers with Internal Packing, F. G. Donnan and Irvine Masson. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 236T-238T and (discussion) pp. 238T-241T, 1 fig. Mathematical expressions suggested as preliminary basis for experimental study of factors which govern design and operation of internally packed gas-scrubbing towers.

Tar Extractors. Design for Tar Extractor, C. E. Reese. Gas Age, vol. 46, no. 2, July 26, 1920, pp. 41-44, 5 figs. An original design of centrifugal-baffle cleaner for removing solids and fog from gas or vapor. Special application is claimed for removing tar from artificial gas, oil and water from natural gas, and water from steam.

GAS DISTRIBUTION

Boosters. Notes on Fifty Years' Work of the Manchester District Institution of Gas Engineers, H. Kendrick. Gas Jl., vol. 149, no. 2964, Mar. 2, 1920, pp. 497-502, 4 figs. Characteristic curves of typical boosters are given and their significance is interpreted.

Centrifugal Booster. Problems of Boosting Gas, D. Balfour Bain. Gas Rec., vol. 17, no. 7, Apr. 14, 1920, pp. 42-44, 4 figs. Characteristics and advantages of centrifugal booster are pointed out.

Problems. Solution of Gas Distribution Problems at Alton, Ill., C. E. Reese. Gas Age, vol. 44, no. 12, Dec. 15, 1919, pp. 523-528, 10 figs. Concerning pressure, quality, condensation and calorimetry.

GAS ENGINES

Blast-Furnace-Gas-Operated. Gas Blowing Engines at Jarrow. Iron & Coal Trades Rev., vol. 101, no. 2739, Aug. 27, 1920, pp. 260-262, 5 figs. Notable feature is casting of cylinder body in two halves, each half being cast with valve portion at bottom and with large head of metal above central flange. Two halves are hydraulically forced over liner. Pistons, built according to Galloways' patent, are water-cooled.

Carburation Requirements. Carburation Requirements of a Typical Gas Engine, P. A. Tice. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1452-1457, 17 figs. From work done with Hinkley 4.5 × 5.5-in. four-cylinder, overhead valve, heavy-duty engine, it was concluded that relative engine speed has little effect on fuel utilization, working cylinder pressures and carburation requirements, relative load of engine being dominant controlling factor and specific working pressures direct functions of relative vapor content of charge.

Design. Factors of Design in the Construction of Gas Engines, E. W. Roberts. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1320-1322. Writer relates briefly some of difficulties he has encountered during twenty years' experience and shows how they may be overcome.

Efficiency. Gas-Steam Unit Shows 72.3 Per Cent Thermal Efficiency at Ford Works, L. D. Royer. Power, vol. 51, no. 14, Apr. 6, 1920, pp. 532-535, 4 figs. Results from 1-hr. test show thermal efficiency based on high heat value of gas of 23.1 per cent for gas-engine cylinders and heat recovery from exhaust gases of 49.3 per cent.; on steam-engine cylinders thermal efficiency of 20.4 per cent, made possible by hot exhaust gas jacketing; over-all thermal efficiency of unit 17.3 per cent; combined mechanical efficiency of unit, 79.2 per cent.

Farm-Pump. Manufacturing a Farm Pump Engine, J. V. Hunter. Am. Mach., vol. 52, no. 18, April 29, 1920, pp. 943-946, 11 figs. Small pump operated by gas engine, manufactured by Fuller & Johnson Co., Madison, Wis.

Generator Drive. Gas Engines Driving Electric Generators and Blowers. Engineering, vol. 108, no. 2809, Oct. 31, 1919, pp. 576-578, 7 figs., partly on 2 supp. plates. Engines are of tandem double-acting, 4-stroke cycle type.

Gorham. The Gas Engine in Marine Service, A. Vincent Clarke. Gas & Oil Power, vol. 15, no. 174, Mar. 4, 1920, pp. 89-90, 2 figs. Features of Gorham six-cylinder 500-hp. engine and Galusha producer designed to work satisfactorily even when ship is rolling.

Governors. Stabilized Governing, Oscar C. Roos. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 141-144, 9 figs. "Dead beat" governor for auto-truck radio plants.

See also GOVERNORS, Centrifugal.

Heat Consumption. Gas Engines (Gasmaschinen), Rudolph Schick. Kraft und Betrieb, vol. 3, no. 11, Sept. 1, 1919, pp. 129-131. Comparative calculations of heat consumption of steam engine and gas engine. Utilization of furnace and coke-oven gases is discussed and gasification of fuels is described.

High-Power. The Development and Use of High-Power Gas Engines, Walter Crooke and John Lyon Ewan. Iron & Coal Trades Rev., vols. 99 and 100, nos. 2697, 2698 and 2699, Nov. 7, 14 and 21, 1919, pp. 590-598, 623-625, and 659-661, 14 figs. Design features of four-stroke, horizontal, double-acting tandem arrangement. Tests with non-recovery producer gas on 2-cycle single-acting engines; curves showing variation of consumption of heat units, mechanical efficiency and overall efficiency load for gas engines running on Mond recovery producer plant.

Indicator for. A New High-Speed Gas-Engine Indicator. Power, vol. 51, no. 18, May 4, 1920, pp. 720-722, 5 figs. Design developed by United States Bureau of Standards to meet special research requirements.

Knocking in. Knocking in Gas Engines, Mark Meredith. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 385-386. Causes which develop knocking. Instances quoted where, after numerous investigations, knocking was found to be due to slackness in flywheel.

Körting. Determination of the Degree of Irregularity of a Single-Cylinder Körting Gas Engine and Construction of Curve of Angular Deviations (Ermittlung des Ungleichförmigkietsgrades eines einzylindrigen Körtingsten Gasmotors und Aufzeichnung der Kurve der Winkelabweichungen), O. Bauer. Der praktische Maschinen-Konstrukteur, vol. 53, no. 9, Mar. 4, 1920, pp. 66-72, 4 figs. Gives graphical method and results of investigations which are believed should be of influence in the constructive development of the gas engine.

See also Nürnberg.

Large. Large Gas Engines (Grossgasmaschinen). Der praktische Maschinen-Konstrukteur, vol. 53, no. 5, Feb. 5, 1920, pp. 33-38, 7 figs. Details of large gas engine built by the Schleifmühle Machine Works.

See also Nürnberg.

Lighting-Unit, Machining. Machining the Gas Engine for a Lighting Unit, J. V. Hunter. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 765-767, 7 figs. Unit combining single-cylinder kerosene engine direct-connected to 1½-kw. generator, and operating in connection with storage battery.

Mine Plants. The Gas Engine at the Mine. Gas Engine, vol. 22, no. 7, July 1920, pp. 222-224, 4 figs. Combined gas-engine and steam-turbine installation at Bergmannsglueck mine at Buer in Westphalia, Germany.

The Gas Power Station of the Bergmannsglück Mine in Westphalia (Die Gaskraftwerk auf der Schachtanlage Bergmannsglück, Buer i. Westf.). Oel- u. Gasmaschine, vol. 17, no. 2, Feb. 1920, pp. 17-20, 6 figs. It is claimed that by the use of gas engines 1 kg. of fuel is saved for every kw-hr. Description and illustrations of engine plant, which is equipped with 2350-hp. double-acting 4-stroke engines in tandem arrangement, with cylinders of 1250 mm. diameter and 1300 mm. stroke.

Nürnberg. Modern Large Gas Engines, H. Dubbel. Eng. Progress, vol. 1, no. 9, Sept. 1920, pp. 282-286, 12 figs. Details of Nürnberg, Körting and other types.

Operating Cost. See TEXTILE MILLS, Gas Engines for.

Preignition. Early Firing and Pre-Ignition in the Gas Engine, W. A. Tookey. Gas World, vol. 73, no. 1878, July 17, 1920, pp. 45-46, 2 figs. Consideration of time element, attainment of maximum pressure, and gradation of pressures.

Premier. New "Premier" Vertical Gas Engine. Gas Engine, vol. 22, no. 7, July 1920, p. 228, 1 fig. Single-crank four-cylinder design.

Small. Small Powered Commercial Gas and Oil Engines, R. A. Maclean. Model Engr. & Elecn., vol. 41, no. 974, Dec. 25, 1919, pp. 583-587, 4 figs. Design of 1-b.hp. engine to run on gas or oil.

Small, Manufacture of. Machining the Gas Engine for a Lighting Unit, J. V. Hunter. Am. Mach., vol. 52, no. 19, May 6, 1920, pp. 995-998, 12 figs. Miscellaneous operations in connection with manufacture of gas engine for small self-contained lighting unit.

Textile Mills. See TEXTILE MILLS, Gas Engines for.

GAS EXPLOSIONS

Radiation in. The Calculation of Radiation Emitted in Gaseous Explosions from the Pressure-Time Curves, W. T. David. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 66-83, 6 figs. Derivation of formulæ for determining emission of radiation during explosion and subsequent cooling of inflammable mixtures of coal gas and air of various strengths in cylindrical vessel whose diameter is equal to its length and whose walls are black. Formulæ express emission in terms of factors entering in pressure time-curves for mixtures.

GAS FIELDS

See OIL FIELDS, Relationship with Gas Fields.

GAS HOLDERS

Dismantling. Moving 100,000 Cu. Ft. Holder, W. D. Birbeck. Gas Rec., vol. 16, no. 12, Dec. 24, 1919, pp. 15-16, 1 fig. Details of dismantling Fond du Lac holder and erecting it at Manitowoc, Wis.

Ice Formation in. Chasing Ice from Gas Holders, Walter V. Turner. Gas Rec., vol. 16, no. 10, Nov. 26, 1919, pp. 11-17, 8 figs. Methods used by various companies for safeguarding storage holders from formation of ice in cups and tanks during cold snaps.

GAS INDUSTRY

Coal Research Work. The Results of Modern Coal Research Work in Connection with the Gas Industry (Die Ergebnisse der modernen Kohlenforschung und ihre Beziehungen zur Gasindustrie), P. Schläpfer. Feuerungstechnik, vol. 8, no. 9, Feb. 1, 1920, pp. 77-81. Notes on distillation of coal at high and at low temperature, and under pressure, extraction of coal, and effect of chemical reagents. In writer's opinion it has been shown that production of raw materials for the iron, explosives and dye industries can be best effected and with least expense by the distillation process, and the heating gas which is recovered by this process is also a valuable product.

Needs and Possibilities. By-Product Research in the Industry, F. W. Sparr. Gas Age, vol. 45, no. 1, Jan. 10, 1920, pp. 1-5, 4 figs. Discussion of present needs and future possibilities of gas industry.

Petroleum Shortage and. The Gas Industry and the Petroleum Shortage, Oscar H. Fogg. Chem. Age, vol. 28, no. 5, May 1920, pp. 174-177. Deals with economics of gas oil, points out inequity of obsolete candle-power requirements, and recommends reduction of calorific standard. Conservation of our resources said to be vital to gas industry.

GAS LIGHTING

See LIGHTING, Street.

GAS MAINS

Corrosion. Internal Corrosion of Mains, Services and Meters, J. G. Taplay. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 481-485. Report of Life of Gas Meters Joint Committee of Instn. of Gas Engrs. Findings based on examination of 26 corrosion deposits and liquors contributed by engineers from different parts of England. Preliminary conclusions are given having reference to destructive influence of hydrocyanic acid, salts produced by interaction of ammonia and carbon bi-sulphide, oxygen and carbon dioxide.

Molding. See MOLDING METHODS, Large Gas Mains.

Pressure Regulation. Regulation for High and Low Pressure Mains, Geo. T. Macbeth. Gas Age, vol. 44, no. 10, Nov. 15, 1919, pp. 443-445, 3 figs. Experience in regulating pressures from transmission or pumping mains into distribution mains.

Submerged. Laying Submerged Gas Mains, D. L. Hill. Gas Age, vol. 46, no. 6, Sept. 25, 1920, pp. 213-215, 1 fig. Particulars of various submerged mains, notably Astoria 72-in. double-line, Toronto 12-in. line, and 36-in. water main across Narrows, New York Harbor.

[See also PIPE, CAST-IRON, Joints.]

GAS MANUFACTURE

Bituminous Shale as Source. Production of Gas from Bituminous Shales (Gaserzeugung aus bituminösem Schiefer), Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 62, no. 52, Dec. 27, 1919, pp. 774-776. It is stated that in parts of Germany, especially Württemberg, the gasification of bituminous shales for production of lighting and heating gas in gas plants in vicinity of such shales is being seriously considered. A study of this method of gas production from technical and economic standpoint is said to show that it is technically practicable but economically of questionable value.

By-Product Recovery. Rochester By-Product Activity, R. E. Krueger. Gas Age, vol. 45, no. 2, Jan. 26, 1920, pp. 59-65, 6 figs. Experience of Rochester Gas and Electrical Corp. in recovery, utilization and marketing of by-products produced in making gas.

Coal Costs for Various Systems. Net Cost of Coal for Various Systems of Gasification. Gas. Jl., vol. 148, no. 2952 and 2953, Dec. 9 and 16, 1919, pp. 541-543 and 604-605, 11 figs. Dec. 9: Systems considered are: Continuous vertical, high steaming retorts; horizontal retorts; mixture of 75 per cent coal gas from horizontals and 25 per cent blue water gas; continuous verticals, moderate steaming; and continuous vertical retorts, non-steaming. Dec. 16: Charts indicating net cost of coal and cost of B.t.u. delivered to consumer, prepared for prices from five to eleven dollars per ton.

Debrouwer Chargers. See Retorts.

Dessauer Vertical Ovens. Efficiency and Acceptance Tests of Dessauer Type of Vertical Oven (Leistungs-und Abnahmeversuche an Vertikalöfen Dessauer Systems), Karl Bunte. Journal für Gasbeleuchtung, vol. 62, no. 37, Sept. 13, 1919, pp. 526-530. Details of tests conducted at Pforzheim, Halberstadt and Zwickau. Coal analysis, guaranties and efficiency.

Economies of Production. Tests on Carbonization at Uddingston. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 492-504, 2 figs. Report of Research Committee of Instn. of Gas Engrs., giving account of first stage of investigation into comparative economies of production, from thermal and chemical standpoints, of different grades of gas. Appendices give in detail method of calibration and analyses employed in research.

Effect of Inerts on Efficiency. Effects of Inerts on Thermal Efficiency, J. W. Wood. Gas World, vol. 71, no. 1846, Dec. 6, 1919, pp. 451-453. Also Gas Jl., vol. 148, no. 2952, Dec. 9, 1919, pp. 545-548, 1 fig. Admission of inerts to gas is characterized as being commercially advantageous because ingress of definite amount of inerts at retort is said to mean less likelihood of loss of valuable coal gas to settings.

Gasification, Theory of. Study on the Gasification Theory (Zur Theorie des Vergasungsvorgangs), Wa. Ostwald. Chemiker-Zeitung, vol. 45, no. 52, April 29, 1919, pp. 229-231, 5 figs. Comprehensive arrangement of all imaginable gasification processes is said to permit of classification according to their thermo-chemical, volumetric and other qualities.

Gas-Oil Requirements. Gas Oil Situation. Natural Gas and Gasoline, vol. 14, no. 8, Aug. 1920, pp. 241-243. Results of Gas-Oil Committee investigation under auspices of Am. Gas Assn. Quantities of carbureted water gas and oil gas made in 1919 are mentioned, quantity required for 1920 is estimated and prospects for supplying required demand are studied.

Gas-Oil Supply. Future Supply of Gas Oil. Gas Rec., vol. 17, no. 11, June 9, 1920, pp. 11-14. Report of gas oil committee of Am. Gas Assn. submitting results of its investigations relative to present shortage and future supply gas making. Two materials are suggested as substitute for distillate gas oil, namely, reduced or topped crudes, and crude Mexican oil.

Generating Sets, Sizes of. Tables for Gas Engineers, A. W. H. Griepe. Gas Age, vol. 45, no. 6, Mar. 25, 1920, pp. 256-257, 2 figs. Data given include sizes of water-gas generating sets and of oil-gas generating sets, together with capacities of coal-gas benches.

Germany. Fluctuation in the Gas Production of German Gas Works During the War (Die Schwankungen in der Gaserzeugung in den deutschen Gasanstalten im Kriege). Jl. für Gasbeleuchtung, vol. 62, no. 45, Nov. 8, 1919, pp. 668-672, 4 figs. Report of the Gas Utilization Headquarters, Berlin, giving statistics of production with aid of tables and charts.

Heating Value Indicator. Heating Value Indicator, Edward J. Brady. Gas Industry, vol. 20, no. 1, Jan. 1920, pp. 27-29. Flame is burned with continually increasing ratio of air to gas. When yellow tip disappears heating value is read off from prepared scale.

A New Heat Value Indicator for Gasworks Use, Edward J. Brady. Gas World, vol. 71, no. 1844, Nov. 22, 1919, pp. 410-412, 8 figs. Apparatus designed for study of flame characteristics.

Horizontal Retort Installations. Carbonization. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 505-510. Descriptions of various English horizontal carbonization plants illustrating efforts which have been made to satisfy present-day requirements. Paper presented before Instn. of Gas Engrs.

Lignite Gas. Lignite for Gas Making, W. D. Wilcox. Gas Rec., vol. 18, no. 4, Aug. 25, 1920, pp. 11-14. Tests. Gas from sub-bituminous coal had heat value of about 550 B.t.u.; lignite gave gas slightly better than 450 B.t.u. before purification.

Mixed Gas. Favors 450 B.t.u. Mixed Gas, J. C. Dickerman. Gas Rec., vol. 18, no. 1, July 14, 1920, pp. 11-13. Writer believes that a mixture of blue water gas and coal gas having a heating value of approximately 450 B.t.u. will serve the consumer efficiently and eliminate use of gas oil without wasting the investment in present water gas plants.

Munich Chamber Ovens. Tests Made with Ries

Type of Munich Chamber Ovens (Versuche an Münchener Kammeröfen Bauart Ries), K. Bunte. Journal für Gasbeleuchtung, vol. 62, no. 33, Aug. 16, 1919, pp. 461-465. Charging and discharging of oven having three chambers is said to have been accomplished in 10 min.

Ovens. The Otto Horizontal Uniform-Draft Chamber Oven in the Kiel-Wik Gas Works (Der Horizontal-Gleichzug-Kammerofen, System Otto, im Gaswerk Kiel-Wik II), H. Voigt. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 2, Jan. 10, 1920, pp. 20-22, 1 fig. Details of furnace plant composed of main furnaces and a producer plant for heating of furnaces, latter consisting of a reinforced-concrete furnace room with bunker capacity of 90 tons and containing six revolving grate producers. Gives results of a 9-day test of plant, demonstrating its economic operation.

See also Dessauer Vertical Ovens; Munich Chamber Ovens.

Processes. Coal Gas in Industry, Harold Hartley. Gas Jl., vol. 149, no. 2960, Feb. 3, 1920, pp. 247-251, 7 figs. Comparative efficiency of various processes of manufacture.

Regenerator vs. Recuperator. Regenerator vs. Recuperator and the Kiel Recuperative Furnace Plant (Regenerator gegen Rekuperator und die Kieler Gleichzugofenanlage), O. Friese. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 33, Aug. 14, 1920, pp. 525-527, 1 fig. From results of two years of operating experience with a horizontal recuperative furnace plant at Kiel, writer claims to have demonstrated the superiority of the recuperative furnace over the regenerative furnace for the manufacture of illuminating gas, provided both systems are operated under equally favorable conditions—that is, in connection with a central generator.

Retort Discharger. The Besnard Retort Discharger. Gas Jl., vol. 151, no. 2986, Aug. 4, 1920, p. 240, 4 figs. Patented apparatus consisting of rake so mounted on end of a horizontal iron tube that it can be extended in horizontal position or brought down at right angles by its own weight and by operation of carrier tube.

Retorts. Heavy Duty Through Retort Operation in St. Louis, J. L. Eigenbrot. Gas Age, vol. 44, no. 9, Nov. 1, 1919, pp. 395-396, 2 figs. Handling horizontal through retorts with heavy duty Debrouwer chargers and dischargers.

Inclined Retorts at Charlotte, S. Bent Russell. Gas Age, vol. 45, no. 7, Apr. 10, 1920, pp. 287-291, 8 figs. Description of installation including discussion of design and handling of materials.

Output and Acceptance Tests with Vertical Retorts of the Dessauer System (Leistungs- und Abnahmeversuche an Vertikalöfen Dessauer Systems durch die Lehr- und Versuchsgasanstalt), Karl Bunte. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 62, no. 38, Sept. 20, 1919, pp. 548-552. Presents tables giving results of distillation tests and output tests in Heidelberg and Braunschweig, carried out by Prof. Terres for the Gas Experimental Inst.

Practical Hints on Retort House Operation, Carl B. Wyckoff. Gas Age, vol. 44, no. 9, Nov. 1, 1919, pp. 389-392, 1 fig. Concerning introduction of primary air into bench, arrangement of secondary air ports, form of steam superheater, temperature to maintain in retort and making Orsat tests.

Progress Steaming Retorts, L. J. Willien, Jr. Gas Rec., vol. 16, no. 9, Nov. 12, 1919, pp. 35-46, 4 figs. Review of work accomplished in United States and other countries. Paper read before Am. Gas Assn.

Some Notes on the Reconstruction of Vertical Retorts, T. W. Harper. Gas Jl., vol. 151, no. 2991, Sept. 8, 1920, pp. 512-514 and (discussion) pp. 514-516. Experience in reconstruction of Woodall-Duckham vertical gas plant.

Steaming Horizontals, R. J. Rew. Gas World, vol. 71, no. 1834, Sept. 13, 1919, pp. 201-202, 1 fig. Manner of proceeding. Advantages of short-period steaming.

The Casting of Gas Retorts. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 478-481, 4 figs. Results of experiment in which it was desired to ascertain conditions required for successful casting of refractory ware containing high percentage of grog. Committee report presented at meeting of Instn. of Gas Engrs.

[See also COAL, Carbonization; Conservation; GAS HOLDERS; WATER GAS.]

GAS MASKS

Carbon-Monoxide. The Removal of Carbon Monoxide from Air, Arthur B. Lamb, William C. Bray and J. C. W. Frazer. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 213-221. Summary of investigations carried on at American University Experiment Station of Bureau of Mines and at coöperating laboratories during 1917 and 1918. These investigations led to development and manufacture of carbon monoxide mask for naval use.

Charcoals for. Some Properties of Charcoals, H. E. Cude and G. A. Hulett. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 391-401, 8 figs. Determination of various types of charcoal used in gas warfare.

The Heat of Absorption of Vapors on Charcoal, Arthur B. Lamb and A. Sprague Coolidge. Jl. Am. Chem. Soc., vol. 42, no. 6, June 1920, pp. 1146-1170, 9 figs. Measurements of heat of absorption of 11 organic liquids upon charcoal at 0 deg. cent. Values were found to be independent of rate of absorption of vapor and previous history of charcoal.

Fire Protection, Uses in. Army Type Gas Mask in Fire Protection, J. I. Banash. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 160-164. Recommendations in regard to manner of using.

Safe Practice in Using. Safe Practice in Using Gas Masks, A. C. Fielder and S. H. Katz. Safety Eng., vol. 38, no. 6, Dec. 1919, pp. 318-319. List of atmospheres where army gas masks will not protect.

Tissor. Experiments with the Tissor Gas Mask, J. D. James. Safety Eng., vol. 38, no. 3, Sept. 1919, pp. 148-150, 5 figs. Mask was found not to give protection against carbon monoxide. Changes made in order to make it give protection against that gas are explained.

Types. Gas As a Weapon in Offensive and Defensive Warfare (Das Gas als Kampfmittel in Angriff und Abwehr), Wilhelm Greb. Zeitschrift für komprimierte und flüssige Gase, vol. 20, no. 4, 1919, pp. 38-41, 1 fig. Description of German, French, English, Russian, Italian and other forms of gas masks.

Gas in Defense, Amos A. Fries. Nat. Service & Internat. Military Digest, vol. 6, no. 5, Nov. 1919, pp. 273-277, 5 figs. Development of gas mask, specially in America, and comparison of principal types constructed by various belligerents.

GAS METERS

Dry Type. Lessons from the Use of Dry Gas Meters During the War (Was lehrt die Herstellung der trockenen Kriegsgasmesser?), H. Pulst. Jl. für Gasbeleuchtung, vol. 62, no. 47, Nov. 22, 1919, pp. 693-697, 10 figs. Mechanisms of war-time gas meters. While opinion is expressed that brass is generally the most desirable and zinc the least desirable metal for the

manufacture of gas meters, it is pointed out that for certain parts of the mechanism substitute metal may be successfully and economically employed.

Electric. Electrically Operated Meters for Air and Gases (Elektrisch betätigte Messer für Luft und Gase). Elektrotechnischer Anzeiger, vol. 36, no. 124, Nov. 4, 1919, pp. 589-590, 2 figs. Thomas meter constructed by the Julius Pintsch Co. for determination of volume of air or gas transmitted through pipe line under pressure or by vacuum.

The Thomas Electric Gas Meter, Ralph H. Earle. Armour Engr., vol. 11, no. 3, March 1920, pp. 181-194, 14 figs. Designed for measurement of gas in large quantities. Gas is warmed exactly 2 deg. by means of electric heater. Measure of electrical energy required by heater is measure of gas flowing.

Flow Measurement. The Effect of Pressure and Temperature on a Meter for Measuring the Rate of Flow of a Gas, N. W. McLachlan. Phys. Soc. of London, vol. 32, part 1, Dec. 15, 1919, pp. 1-20, 11 figs. Theory of instrument for measuring rate of flow of gas is outlined, effects of variation of temperature and pressure of gas being taken into consideration. This theory is tested experimentally for pressures varying from 1250 to 250 mm. Hg., and for temperatures from 10 to 100 deg. cent.

GAS, NATURAL

See NATURAL GAS.

GAS PIPE

Cast Iron, Joints for. Cast Iron Pipe Joints. Natural Gas & Gasoline Jl., vol. 14, no. 1, Jan. 1920, pp. 13-16. Recommendations made by Am. Gas Assn. Committee appointed for purpose of preparing satisfactory design for joints for cast-iron mains.

GAS, PRODUCER

See PRODUCER GAS.

GAS PRODUCERS

Bituminous-Coal. Gasification of Bituminous Coal in Modern Revolving Grate Producers (Die Vergasung von Braunkohle in neuzeitlichen Drehrost-Gaserzeugern), Kurt Neumann. Stahl und Eisen, vol. 39, no. 42, Oct. 16, 1919, pp. 1233-1239. Details of three tests made. Tables showing gas analysis; measurements of coal, steam and air; calculation of decomposition of steam and of highest temperatures; critical discussion of tests and comparison with other similar tests.

Calculation of. Calculations for Use in the Construction and Operation of Gas Producers and Open-Hearth Furnaces (Berechnungen, wie sie Bau und Betrieb von Gaserzeugern und Martinöfen bedingen), Bernhard Osann. Feuerungstechnik, vol. 8, no. 6, Dec. 15, 1919, pp. 45-47. Solutions of mine problems met in such work by a professor at the Academy of Mines in Clausthal.

Double. The Heat Balance of Double Gas Producers (Wärmebilanz des Doppelgasgenerators), H. Strache, A. Breisig and A. Gross. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 25, June 19, 1920, pp. 399-404. The heat balance of the double-gas plant in the municipal gas works of Gratz, Austria, is calculated from experiments made under a guarantee test, results of which showed a comparatively high loss of heat in steam superheater, subsequently attributed to the insufficient supply of secondary air for the combustion of the hot blast gas, so that carbon monoxide was contained in the exhaust gases. Results of calculation of carbon balance are also given.

Galusha. See GAS ENGINES, Gorham.

Glass-Works Plant. Producer Gas As Fuel for the Glass Industry, F. J. Denk. Jl. Am. Ceramic Soc., vol. 3, no. 2, Feb. 1920, pp. 94-113, 2 figs. Notes on types of producers, location and layout of producer plant, increasing efficiency of producers, regenerating chambers and size of stacks. In appendix comparative calculation of first cost and operating cost for fuel oil and producer gas is given.

Grateless. Grateless Gas Producers, with Special Reference to Those in Which the Liquid Clinker is Tapped (Ueber rostlose Gaserzeuger, besonders mit flüssigen Schlackenabstich), Hubert Hermanns. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 17-18, May 1, 1920, pp. 351-354, 8 figs. It is pointed out that the two types of grateless producers in general use are Heller type of small producer with narrow gasification chamber, and large producer with tapping of the liquid clinker, aim of latter being the gasification of small-size waste fuel and the production of low-temperature tar.

Lignite. See LIGNITE, Gasification of.

Marine. Producer Gas for Marine Power. Gas & Oil Power, vol. 15, no. 179, Aug. 5, 1920, pp. 175-178, 3 figs. Report of trials of gas producers patented by D. J. Smith. Consumption trials were carried out on gasoline at various speeds and then at the same speeds on producer gas. Consumption of gasoline and coal for same work was relatively equal.

Mechanical. Smith Mechanical Gas Producer. Power, vol. 52, no. 15, Oct. 12, 1920, pp. 572-573, 2 figs. Type of gas producer in which fuel is distributed mechanically over bed and poking done automatically, developed by Smith Gas Engineering Co., Dayton, Ohio.

Operation. Operation of a Gas Producer, J. S. McClimon. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 632-635, 1 fig. Suggestions in regard to various details of operation.

Operation of a Modern Gas Producer, H. N. Trumbull. Blast Furnace and Steel Plant, vol. 8, no. 9, Sept. 1920, pp. 512-515, 1 fig. General description and rules pertaining to successful operation of Wellman gas producer; operation of turbo-blower in connection with gas producer.

The Lay-Out and Operation of a By-Product Producer Gas Plant, W. H. Patchell. Eng. & Indus. Management, vol. 3, no. 20, May 13, 1920, pp. 619-623, 2 figs. Description of the Lymn gas plant, installed in 1915 by the Hoffman Mfg. Co. which is said to differ from the Mond system in important constructional and operating details, and which arose out of investigation as to what was best form of prime mover for large works to adopt in their next extension. Summary of investigation and its results. Paper before Instn. Elec. Engrs.

The Making of Better Producer Gas, A. Clark Liscom. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 334-337, 2 figs. Points of interest in operation of large gas-producer plant. Kind of coal to use, tar separation and gasification in producer, making possible 200-B.t.u. gas.

Suction Type. The Suction Type Gas Producer, L. E. Safford. Ice & Refrigeration, vol. 58, no. 5, May 1920, pp. 269-271, 2 figs. Theory of operation is explained and particulars of construction are indicated.

Tar and Sulphate of Ammonia Production. The Economy of Gas-Producer Plants in the Production of Crude Tar and Sulphate of Ammonia (Ueber die Wirtschaftlichkeit von Gaserzeugungsanglagen bei Gewinnung von Urteer und schwefelsaurem Ammoniak), E. Roser and G. Klingenberg. Stahl u. Eisen, vol. 40, nos. 16 and 18, Apr. 22 and May 6, 1920, pp. 533-541 and 610-613 and (discussion) pp. 613-621, 4 figs. Debate based on previous articles by authors. Tabular data of operation and production costs are included.

Tar Recovery in. The Recovery of Fuels at Low Temperatures (Die Entstehung der Brennstoffe bei tiefen Temperaturen), H. Gwodz. Oel- u. Gasmaschine, vol. 17, no. 8, Aug. 1920, pp. 119-125, 7 figs. Details of various patented gas producers provided with tar-recovery apparatus.

Thyssen. The Economy of Gas Producer Plants in the Production of Low-Temperature Tar and Sulphate of Ammonia (Die Wirtschaftlichkeit von Gaserzeugungsanlagen bei Gewinnung von Tieftemperaturteer und schwefelsauren Ammoniak), E. Roser. Stahl u. Eisen, vol. 40, nos. 11 and 12, Mar. 1 and 18-25, 1920, pp. 349-357 and 387-395, 14 figs. Discussion of cost and recovery of by-products through gasification of anthracite, lignite briquets and a mixture of the two, and economy of gasification plants in recovery of by-products is demonstrated by use of producer gas for heating and generating purposes. Description and illustrations of fifteen revolving-grate producers of the Thyssen type and tables giving heat obtained from 1 kg. of coal, cost of production of gas and other data. Report from Steel Works Committee of Assn. of German Foundrymen.

GAS RANGES

See ELECTRIC RANGES.

GAS TUBING

Tests. Tests of Flexible Gas Tubing, R. S. McBride and Walter M. Berry. Techn. Papers Bur. Stand., no. 133, Oct. 27, 1919, pp. 37, 6 figs., partly on five supp. plates. Undertaken with a view to establishing basis for drawing suitable specifications.

GAS TURBINES

Aeronautical. The Possibilities of an Aeronautical Gas Turbine, C. A. Norman. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 914-917, 8 figs. Discussing report that German engineers have developed aeronautic gasoline turbine engine, writer concludes that such an engine is a possibility but that its advantages would not be of consequence.

Holzwarth. The Holzwarth Gas Turbine. Gas & Oil Power, vol. 15, no. 177, June 3, 1920, pp. 145-147, 5 figs. Account of progress made in Germany since 1914 in development of Holzwarth type of gas turbine, extracted from article in Jl. Assn. German Engrs. (Zeitschrift des Vereines deutscher Ingenieure, Feb. 28, 1920).

Practicability of. The Problem of the Gas Turbine and Its Industrial Consequences (Le problème de la turbine a gaz et ses conséquences industrielles), Marcel de Coninck. Technique Moderne, vol. 12, no. 6, June 1920, pp. 250-262, 19 figs. Industrial practicability of gas turbines is demonstrated in comprehensive technical study of his thermal characteristics. Structural details are visualized.

GAS WARFARE

Gas Masks. See GAS MASKS.

German Gases. Gas Warfare in the European War of 1915 to 1918 (Les gaz de combat, et leur emploi dans la guerre européenne, de 1915 a 1918), Daniel Florentin. Génie Civil, vol. 76, no. 18, May 1, 1920, pp. 409-411. Gases used by the Germans.

Mustard Gas. The History of Mustard Gas, Clarence J. West. Chem. & Met. Eng., vol. 22, no. 12, Mar. 24, 1920, pp. 541-542. Based on accounts given in technical trades and unpublished reports of Bureau of Mines.

Projectiles. Gas Warfare in the European War of 1915 to 1918 (Les gaz de combat, et leur emploi dans la guerre européenne, de 1915 à 1918), Daniel Florentin. Génie Civil, vol. 76, no. 19, May 8, 1920, pp. 427-432, 11 figs. Gas projectiles used.

GAS WORKS

Boiler Operation. See BOILER OPERATION, Gas Works Plants.

Chemists in, Value of. Value of the Chemist in the Large and Small Gas Plants, Edward J. Murphy and H. Vittinghoff. Am. Gas Eng. Jl., vol. III, no. 18, Nov. 1, 1919, pp. 422-424. Points out possible yield of 72,000 cu. ft. of gas per ton of coal carbonized as one reason why chemist in large plant is good investment. Arrangement by which small plant can afford a chemist is indicated from papers read before Am. Gas Assn.

Coke Handling. See COKE HANDLING, Gas-Works Equipment.

Light-Oil Recovery Plant. Plant for Recovery of Light Oils at the Vienna-Simmering Gas Works (Die Leichtölanlage des Gaswerkes Wien-Simmering). Zeitschrift für komprimierte u. flüssige Gase, vol. 20, no. 6, 1919, pp. 62-63, 1 fig. Description and schematic diagram of Still system plant in a gas works having a daily output of 18,000,000 cu. ft.

Liverpool. The Linacre Works of the Liverpool Gas Company. Gas Jl., vol. 148, no. 2943, Oct. 7, 1919, pp. 29-31. Constructional details. Works consist of three coal-gas plants, having capacities of 4,800,000 cu. ft., 8,000,000 cu. ft. and 160,000 cu. ft. per day respectively, and an oil-gas plant with capacity of 9,000,000 cu. ft. per day.

Motor Spirit Production. Motor Spirit Production in Small and Medium Gas-Works, H. Steding. Gas Jl., vol. 149, no. 2962, Feb. 17, 1920, p. 368. Advantages of production to gas works are pointed out and nature of gas produced is explained. Paper read before Middle Rhine Association of Gas and Water Engineers. Translated from Journal für Gasbeleuchtung.

Ottawa, Ont. Modern Gas Plant at Ottawa, A. A. Dion. Gas Age, vol. 46, no. 6, Sept. 25, 1920, pp. 209-212, 6 figs. Coal carbonizing plant was designed for ultimate capacity of 6,000,000 cu. ft. per day, in four self-contained units of 1,500,000 cu. ft. Yield of 16,000 cu. ft. per short ton has been obtained with low-grade coals.

Prime Mover for. The Lay-Out and Operation of a By-Product Producer-Gas Plant, W. H. Patchell. Gas Engine, vol. 22, no. 8, Aug. 1920, pp. 233-236 and 245, 2 figs. Description and results of investigation as to best form of prime mover for a large works to adopt in an extension of its plant.

Relocation of. Increasing the Radius of Profitable Distribution by a Relocation of the Generating Plant, L. W. Alwyn-Schmidt. Am. Gas Eng. Jl., vol. 112, no. 6, Feb. 7, 1920, pp. 97-99, 1 fig. Discusses problems presented to gas companies as a result of irregular growth of cities.

Sulphate Making. The "Direct" Process of Sulphate Making in Gas-Works. Gas Jl., vol. 151, no. 2986, Aug. 4, 1920, pp. 234-237. Tables giving comparative cost figures of materials and labor of manufacture of sulphate by ordinary distillation and "direct" processes.

Waste-Heat Utilization. See WASTE HEAT, Utilization.

Water-Gas Plant. Electrically-Driven Blast-Fans, H. C. Widlake. Gas Jl., vol. 150, no. 2971, Apr. 20, 1920, pp. 131-133, 2 figs. Description of water-gas plant which comprises four gas-making sets served by three no. 8 Sturtevant blast-fans.

[See also OFFICE MANAGEMENT, Gas Works; WATER GAS, Plants.]

GASES

Absorption in Spray Cooling System. The Absorption of Gases in Spray Systems and Towers,

Edwin M. Baker. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 122-124, 3 figs. Account of tests made using spray system for liquid cooling.

Adsorption of. Studies of the Adsorption of Gases by Charcoal, Harvey B. Lemon and Kathryn Blodgett. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 394-402, 5 figs. To determine how equilibrium pressure at constant volume depends upon composition of mixture, ratio of mass of gas to mass of charcoal remaining the same, when activated and previously evacuated specimen of cocoanut shell charcoal is exposed to excess of mixture of oxygen and nitrogen.

The Adsorption of Gases at Low and Moderate Concentrations, A. M. Williams. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 287-311, 6 figs. Theoretical form of adsorption isostere is found to be log a/ $Cc = B + A/T$ where B and A are functions of α only. Relationship among constants was found to be in good agreement with theory based on existence of thin surface layer.

Atomic Heats. The Homogeneous Equilibrium and Additive Power of the Internal Atomic Heats ($C_v - 3/2$ R) in Ideal Gases. (Homogenes Gleichgewicht und Additivität der inneren Atomwärmen ($C_v - 3/2$ R) bei idealen Gases), Max Trautz. Zeitschrift für anorganische und allgemeine Chemie, vol. 95, no. 1-2, May 5, 1916, pp. 79-104. Results of investigations are given with aid of tables. Writer states his hope to discover systematic deviations from the additive power in the homogeneous gas equilibria was not fulfilled; and he recommends application of the approximate and closer investigation of the absolute additive power.

Automatic Analysis. The Application of the Thermal Conductivity Method to the Automatic Analysis of Complex Mixtures of Gases, E. R. Weaver and P. E. Palmer. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 894-899, 2 figs. Limitations and advantages of method of gas analysis depending upon thermal conductivity, which was described in the Jl. Indus. & Eng. Chem., vol. 12, p. 359, are discussed. Novel expedients are described by use of which method may be employed for analysis of great variety of gas mixtures of industrial importance.

Cleaning by Electricity. Cleaning Gases by Electricity, N. H. Gellert and K. V. Laird. Iron Trade Rev., vol. 66, no. 3, Jan. 15, 1920, pp. 213-217, 9 figs. Authors explain principle of electrical precipitation, describe first plant built, outline method of operation and comment on results obtained. From paper presented before Philadelphia section of Am. Iron & Steel Elec. Engrs.

Combustible, Determination of. Analysis of Combustible Gases by Means of Their Speed of Ignition (Ueber die Beurteilung Brennbarer Gase auf Grund dei Entzündungsgeschwindigkeit), M. Hofsäss. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 62, no. 38, Sept. 20, 1919, pp. 541-548, 14 figs. Description of apparatus for measuring speed of ignition; application of measurements for purpose of analyzing gas.

Compressed, Containers for. High-Pressure Seamless Steel Cylinders. Iron Age, vol. 106, no. 7, Aug. 12, 1920, pp. 377-379, 12 figs. How containers for gases are made from tubes by piercing process and from flat plates by cupping process.

Dielectric Constants of. Dependence of the Temperature of Dielectric Constants of Gases (Ueber die Temperaturabhängigkeit der Dielektrizitätskonstanten von Gasen), Hans Riegger. Annalen der Physik, vol. 59, no. 8, Sept. 19, 1919, pp. 753-760, 2 figs. Results of experiments begun by writer in Danzig in 1914, in order to develop new theories, after he found that number of dielectrics, by changes in temperature, showed deviations from the Clausius-Mossotti formula. Methods and results of measurements.

Dust Precipitation in. A New Electrical Precipitation Treater, Motoji Shibusawa and Yasujiro Niwa. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 890-903, 35 figs. Treater, as in case of modern type, consists of metal cylinder as passive electrode and metal wire suspended along center of cylinder as active electrode; only difference being that electrodes in their treater are entirely separated with dielectric substances such as glass, porcelain, etc. Treater was developed as result of experience at Electrotechnical Laboratory in Tokyo, Japan, and has been recently applied to treater at Nikko Copper Refining Works. Theory of new treater is given in detail.

Precipitation of Smoke, Dust and Vapor with the Aid of Electricity (Bekämpfung von Rauch, Staub und Nebel mit Hilfe der Elektrizität), C. Dähne. Gesundheits-Ingenieur, vol. 43, no. 13, Mar. 27, 1920, pp. 145-148, 11 figs. Review of processes and recommendations for the electric purification of gases.

Thermal Filters, W. D. Bancroft.. Jl. Physical Chem., vol. 24, no. 6, June 1920, pp. 421-436. Experiments to show that a hot surface repels dust particles in air.

Electric Discharge in. See ELECTRICITY, Discharge in Gases.

Entropy of. The Entropy of Gases, Richard C. Tolman. Jl. Am. Chem. Soc., vol. 42, no. 6, June 1920, pp. 1185-1193. Comparison of experimental results of entropy at one atmosphere and 298 deg. absolute and values determined theoretically from formula.

Flow of. See FLOW OF GASES.

Flue, Specific Heat of. See FLUE GASES, Specific Heat.

High Temperatures, Raising to. A Dynamical Method for Raising Gases to a High Temperature Without the Use of High Pressures, W. H. Watkinson. Eng., vol. 110, no. 2852, Aug. 27, 1920, p. 198, 2 figs. Principle is that if air be allowed to flow from atmosphere through spring-loaded wire-drawing valve adjusted so that air in cylinder during charging stroke is constant at pressure of one-quarter of an atmosphere, and if this air is subsequently compressed to atmospheric pressure, then, assuming adiabatic and frictionless conditions and neglecting effect of clearance in pump cylinder, absolute temperature of air at end of compression will be approximately 1½ times absolute temperature of outside atmosphere. Paper read before Eng. Section, British Assn. for Advancement of Science.

Ignition by Hot Wire. The Ignition of Gases by Hot Wires, W. M. Thornton. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 613-633, 9 figs. Article deals with problem of ignition by hot wires, such as may occur in coal mines, battery rooms or in manufacturing processes where combustible gas is set free.

Ignition of. The Ignition of Gases. Part I. Ignition by the Impulsive Electrical Discharge. Mixtures of Methane and Air, Richard Vernon Wheeler. Jl. Chem. Soc., vols. 117 and 118, no. 693, July 1920, pp. 903-917, 4 figs. Technical and experimental research.

Ionization of. Ionization of Gases, J. S. Townsend. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 233-234. Discoveries which have led to advances in knowledge of molecular physics.

The Nature of the Process of Ionization of Gases by Alpha Rays, R. A. Millikan, V. H. Gottschalk and M. J. Kelly. Physical Rev., vol. 15, no. 3, sec. series, Mar. 1920, pp. 157-177, 1 fig. Over 2900 captures of ions from atoms of atomic weight ranging from 1 to 200

have been observed, from which only 5 captures give any evidence of multiply charged atoms, and these were all double positives, probably due to simultaneous advent upon the drop of two singly-charged ions. It is shown that there are in reality two sources of ionization—the alpha particle beam and the active deposit. From Ryerson physical laboratory, University of Chicago.

Kinetic Theory. On the Application of Probabilities to the Movement of Gas-Molecules, F. Y. Edgeworth. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 40, no. 237, Sept. 1920, pp. 249-272. Kinetic theory of gases studied in light of calculus of probabilities.

Light Scattering by. A Re-examination of the Light Scattered by Gases in Respect of Polarization, Lord Rayleigh. Proc. of Roy. Soc., vol. 97, no. 687a, Aug. 3, 1920, pp. 435-450, 7 figs. Table giving actual angular setting of nicol required to equalize images in each case, and also intensity of weak component polarization, taking strong one as 100.

Liquefaction. The Cooling of Gases by the Action of Internal and External Work (Ueber Abkühlung von Gasen durch Leistung innerer und äusserer Arbeit), R. Plank. Physikalische Zeitschrift, vol. 21, no. 6, Mar. 15, 1920, pp. 150-156, 2 figs. Points out that action of gas-liquefaction machines is based on fact that compressed gases by expansion are cooled below the surrounding temperature; expansion can be effected either by external action (adiabatic) or by internal action through throttling; in first method the gas-liquefaction machines of G. Claude are employed and in the second, those of C. Linde, both of which are discussed.

Liquefied. A Study of the Regulations for the Shipment of Condensed and Liquefied Gases by Railroads (Studien über die Vorschriften für die Beförderung verdichteter und verflüssigter Gase auf Eisenbahnen), A. Wogrinz and F. Halla. Zeitschrift des Oesterreichischen Ingenieur u. Architekten-Vereines, vol. 71, no. 42, Oct. 17, 1919, pp. 381-384, 2 figs. Tables and curves are presented showing the relative volumes of nitrogen, oxygen and methane with different pressures and temperatures.

Electric Energy of Escaping Liquid—A Possible Medium for the Improvement of Gas Liquefaction (Elektrische Arbeit ausströmender Flüssigkeit—Ein Mittel zur Verbesserung der Gasverflüssigung?), Walther Meissner. Berichte der deutschen physikalischen Gesellschaft, vol. 21, no. 11-12, June 30, 1919, pp. 369-382, 6 figs. Describes a new method for transforming the kinetic energy of the escaping jet inside of liquefier into potential electric energy which can then be easily conducted from liquefier by means of fine wires; and a method for electrification of liquid hydrogen and helium. Report from the Nat. Physical-Technical Inst.

Investigation of Basic Principles of Construction of Containers for the Transportation of Liquefied Gases (Untersuchungen über die Grundlagen zum Bau von Transportgefässen für verflüssigte Gase), Fritz Banneitz, Gerhard Rhein and Benno Kurze. Annalen der Physik, vol. 61, no. 2, Jan. 15, 1920, pp. 113-144, 8 figs. Investigations are said to show that it is possible even with sheet-steel containers to produce the high vacuum required for the storage of liquefied gases, if the brazing is carefully carried out which, it is said, is best effected with silver solder. The insulation of the neck of a small container can be effected, according to Lilienfeld, by inserting a short glass tube which is joined at both ends to the metal by means of platinum ring joints, while for large containers sufficiently long metal tubes of low conductivity should be used. Report from Physical Inst. of University of Leipzig.

Method and Apparatus for the Liquefaction and Separation of a Highly Condensable Gas Mixture (Verfahren und Vorrichtung zur Verflüssigung und Trennung schwer kondensierbarer Gasgemische), Rudolf Mewes. Zeitschrift für Sauerstoff- und Stickstoff-Industrie, vol. 11, no. 21-22, Nov. 1919, pp. 85-86, 3 figs. Device recently patented which, it is said, has advantage that liquefaction of heating medium occurs at much higher temperatures, so that expanded fluid can be employed at lower pressure as cooling fluid.

Liquid Purification of. Liquid Purification of Gases, Lester M. Goldsmith. Gas Age, vol. 45, no. 4, Feb. 25, 1920, pp. 161-165, 10 figs. Experimental gas purification plant of Atlantic Refining Co. Account of tests made to determine effect of flow.

Low Temperatures and Chemical Constant. Note on the Significance of the Chemical Constant and Its Relation to the Behaviour of Gases at Low Temperatures, F. A. Lindemann. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1290, pp. 21-25. It is shown that chemical constant has dimensions of logarithm of pressure if atomic heat of monatomic gases becomes zero at absolute zero.

Magnetic Susceptibility of. On the Magnetic Susceptibilities of Hydrogen and Some other Gases, Také Soné. Lond., Edinburgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 39, no. 231, March 1920, pp. 305-350, 9 figs. Experimental measurement of susceptibility of air, oxygen, carbon dioxide, nitrogen, argon and hydrogen. Susceptibility of water was taken as -0.720×10^{-6}.

Monatomic. Note on the Resonance and Ionization Velocities for Electrons in the Monatomic Gases, Frank Horton and Ann C. Davies. Physical Rev., vol. 15, no. 6, June 1920, pp. 498-502. Radiation from helium produced by impacts of electrons with 20.4 volts velocity and ionization by 25.6 volt impacts. Radiation from argon and neon produced on collision with electrons having smaller velocities than those required to produce ionization.

Mixtures, Analysis of. Automatic Methods of Gas Analysis Depending Upon Thermal Conductivity. Jl. Indus. & Eng. Chem., vol. 12, no. 4, Apr. 1920, pp. 359-366, 7 figs. Apparatus for continuous analysis of gas mixtures by electrical method depending upon thermal conductivity is described. Method devised by Bureau of Standards is modified by introduction of balanced-bridge arrangement.

Occluded. See PUMPS, Mercury.

Poison. See GAS WARFARE, German Gases; Mustard Gas.

Poisonous Dispersion of. On a New Method of Driving off Poisonous Gases, Hertha Ayrton. Proc. Roy. Soc., vol. 96, no. A-676, Oct. 9, 1919, pp. 249-256, 8 figs. partly on supp. plate. By operation of fan which, when in action, divides space around it into two regions, separated by vertical plane, passing through line in blade of fan parallel to its tip. In region beyond fan air is sucked in irrotational motion in all directions towards fan.

Polyatomic, Chemical Constants of. Derivation of the Chemical Constants of Polyatomic Gases from the Planck Hypothesis (Ableitung der chemischen Konstanten mehratomiger Gase aus dem Planckschen Wahrscheinlichkeitsbegriff), Léon Schames. Physikalische Zeitschrift, vol. 21, no. 2, Jan. 15, 1920, pp. 38-39. After making above-mentioned derivation, writer analyzes weak points in the work of Sackur and Tetrode and compares his derivation with results obtained by them.

Rare, Solubility in Liquids. Experimental Investigation of the Solubility of Rare Gases in Liquids (Experimentelle Untersuchung über die

Loslichkeit der Edelgase in Flüssigkeiten), Andreas von Antorpoff. Zeitschrift für Elektrochem., vol. 25, no. 17-18, Sept. 1, 1919, pp. 269-297, 13 figs. Descriptions and illustrations are given of most important apparatus employed in testing rare gases and in determining solubility. Solubility of helium, neon, argon, and crypton in water. Separation of argon, krypton and xenon. Directions are given for recovery of krypton and xenon. Solubility of krypton in water according to experiments carried out in London by Sir Wm. Ramsay. Solubility of xenon in water, in analine, etc.

Reaction Speeds in. The Theory of Reaction Speeds in Gases (Zur Theorie der Reaktionsgeschwindigkeiten in Gasen), Karl F. Herzfeld. Annalen der Physik, vol. 59, no. 7, Sept. 4, 1919, pp. 635-667. Also in Zeitschrift für Elektrochemie, vol. 25, no. 17-18, Sept. 1, 1919, pp. 301-304. Work of M. Trautz is discussed in historical introduction. Formulæ are presented and compared with measurements of hydrobromic acid by Bodenstein and Lind and found to conform satisfactorily thereto.

Specific Heat. The Variation on the Specific Heat of a Gas with Temperature, George W. Todd. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 40, no. 237, Sept. 1920, pp. 357-362, 2 figs. It is explained how experiments have confirmed principle of equipartition of energy among degrees of freedom of molecules of gas.

Thermal Conductivity. A New Method of Determining the Temperature Variation of the Thermal Conductivity of Gases—I, G. H. Henderson. Physical Rev., vol. 15, no. 1, sec. series, Jan. 1920, pp. 46-57, 3 figs. Describes method by which temperature distribution in gas contained between parallel plates maintained at different fixed temperatures is determined, and series of experiments made with air to test method for temperature differences up to 500 deg. cent. is described. Temperature coefficient between 20 deg. cent. and 500 deg. cent. was determined for air at atmospheric pressure, using author's method.

Viscosity. The End Correction in the Determination of Gas Viscosity by the Capillary Tube Method, A. F. Benton. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 403-408, 1 fig. Comparative study of Fisher's and Brillouin's formulæ.

The Viscosity of Gases (Ueber die Zähigkeit von Gasen), M. Hofsäss. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 62, no. 52, Dec. 27, 1919, pp. 776-777, 4 figs. Results of investigations are said to show that a sufficiently accurate determination of the viscosity of gas mixtures is only possible by means of experiments, and an apparatus is described and illustrated with the aid of which, it is claimed, this determination can be made in simplest manner. Report from the Chem.-Technical Inst. of the Technical High School in Karlsruhe.

Volume Determination of. An Alignment Chart for Calculating the Volume of Gases (Rechentafel zur Volumreduktion von Gasen), W. Ostwald. Zeitschrift für angewandte Chemie, vol. 32, no. 90, Nov. 11, 1919, pp. 359-360, 1 fig. Description and illustration of chart devised by writer for determining reduced volume (dry) of a gas at 760 mm., 0 deg. cent. Reference is made to the reduction chart of M. Hofsäss published recently in same journal (p. 319) and a brief comment from him is appended.

[See also FLAME PROPAGATION.]

GASOLINE

Aeroplane Engine Fuels. See AEROPLANE ENGINES, Fuels.

Alcogas vs. Aviation Gasoline. Comparative Power Properties of Alcogas and Aviation Gasoline, V. R. Gage, S. W. Sparrow and D. R. Harper. Automotive Industries, vol. 42, no. 18, April 29, 1920, pp. 1018-1020, 9 figs. Results of tests using 12-cylinder Liberty engine under varying conditions. Alcogas (mixture of 40 per cent alcohol, 35 per cent gasoline, 17 per cent benzol, and 8 per cent other ingredients) showed about 15 per cent higher thermal efficiency than standard "X" gasoline. From report no. 89 of Nat. Advisory Committee for Aeronautics.

Automobile Fuel. See AUTOMOBILE FUELS, Gasoline.

Cherry Production Process. A New Method of Motor Spirit Production, Louis Bond Cherry. Petroleum Times, vol. 3, no. 66, April 10, 1920, pp. 383-384. Cherry process for producing gasoline and other hydrocarbons by electrochemical means.

Cracking Processes. Motor Gasoline from Heavier Hydrocarbons, Fred W. Padgett. Mech. Eng., vol. 42, no. 7, July 1920, pp. 400-402 and 426. Particulars regarding its preparation by various cracking processes, together with discussion of theory of cracking and notes on present status of industry.

Distillation. Durability of Electric Heaters for Gasoline Distillation, W. A. Jacobs and E. W. Dean. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 343-344. Bureau of Mines electric gasoline distillation heater and commercial device sold for same use were subjected to life tests at maximum current load. Each failed at end of approximately 500 hr., Bureau heater through deterioration of resistance wire, and commercial heater through disintegration of block of insulating material holding resistance wire. From reports of Investigations, U. S. Bureau of Mines.

Fuel Oil, Pyrolysis of. See PETROLEUM INDUSTRY, Problems of.

Hector Fuel vs. Comparison of Hector Fuel with Export Aviation Gasoline, H. C. Dickinson, V. R. Gage and S. W. Sparrow. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1336-1337, 6 figs. Hector fuel, composed of approximately 30 per cent benzol and 70 per cent cyclohexane, was thoroughly tested by Bur. of Standards in a Liberty engine under varying altitude conditions, and compared with standard gasoline. Results are summarized. Abstract from N.A.C.A. report no. 90 and A.P.P. report no. 67.

Natural-Gas. A Great Natural Gas Industry, Oswald F. Schuette. Gas Age, vol. 45, no. 9, May 10, 1920, pp. 392-395. Compilation of facts and figures relating to natural-gas gasoline, demonstrating importance of gas as sources of supply.

Absorption as Applied to Recovery of Gasoline Left in Residual Gas from Compression Plants, W. P. Dykema and Roy O. Neal. Dept. Interior, Bur. Mines, Tech. paper 232, 1920, 43 pp., 15 figs. Report of investigations in regard to recovery of gasoline by means of absorption process from residual gas of plants where motor fuel is obtained from natural gas by mechanical compression and cooling.

Factors in Determining the Gasoline Content in Natural Gas by the Absorption Method, D. B. Dow. Reports of Investigations, Bur. of Mines, serial no. 2157, Aug. 1920, 9 pp., 4 figs. Factors which should be considered in making absorption tests using "mineral seal oil" as absorbent.

Gasoline from Natural Gas, R. P. Anderson and C. E. Hinckley. Jl. of Industrial and Eng. Chem., vol. 12, nos. 6, 8 and 9, June, Aug. and Sept. 1920, pp. 547-549, 735-738 and 852-857, 7 figs. June: Compression, refrigeration and absorption methods for production of gasoline from natural gas. Table of properties of principal gasoline constituents and curves indicat-

ing vapor pressures of some of these hydrocarbons at different temperatures are included. Aug.: Investigation of use of charcoal in testing gas for gasoline, involving study of conditions under which gas should be treated and absorbed gasoline recovered. Description of portable testing outfit. Sept.: Formulæ are developed to correlate principal characteristics of normal paraffin hydrocarbons.

Gasoline from Natural Gas. C. E. Reese. Gas Age, vol. 45, no. 9, May 10, 1920, pp. 382-384, 2 figs. Details of gasoline absorption plant with plan of piping.

Gasoline Recovery, G. A. Burrell and G. G. Oberfell. Natural Gas and Gasoline Jl., vol. 14, no. 7, July 1920, pp. 205-206. Methods of recovery, especially charcoal process, described.

The Charcoal Method of Gasoline Recovery, G. A. Burrell, G. G. Oberfell and C. L. Voress. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 347-349, 1 fig. Charcoal process consists of bringing gas into intimate contact with activated charcoal, whereby recoverable vapors are retained and denuded gas allowed to return to distribution lines.

The Recovery of Gasoline from Natural Gas (Die Gewinnung von Benzin aus Naturgas), W. Heyn. Automobil-Rundschau, vol. 19, no. 15-16, Aug. 1920, pp. 149-153, 4 figs. Describes process for which a simple and comparatively cheap distillation plant is required, consisting of a compressor, a condenser, a separator, a collecting tank and a mechanically operated safety valve.

Production from Heavy Oil Hydrocarbons. Production of Motor Gasoline from Heavy Oil Hydrocarbons, Fred W. Padgett. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 521-525, 3 figs. Study of possible reactions taking place in cracking phenomena, noting particularly action of catalysts upon heating and composition and refining of pyrolytic distillates.

Production, Use and Marketing. Motor Fuels, E. W. Dean. Jl. Franklin Inst., vol. 189, no. 3, Mar. 1920, pp. 269-302, 18 figs. Compilation of data regarding production, use and marketing of gasoline, its physical and chemical properties, quality of products marketed in calendar years 1917 and 1919, and also information in regard to present tendencies in development of substitutes for gasoline.

Quality. Motor Gasoline Survey of Bureau of Mines. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 575 and 583, 1 fig. Tests of samples taken in various large cities of country during latter part of July compared with similar tests made in January last. Increase in average boiling point regarded as seasonal change.

Situation in U. S. The Gasoline Situation, R. L. Welch. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 353-355. Statistics regarding oil production and consumption in U. S.

The Motor Gasoline Situation, N. A. C. Smith. Oil News, vol. 8, no. 9, April 5, 1920, pp. 32-34. It is said that automotive vehicle demand for gasoline has increased in ten years 17 times more than production of crude-oil supplies. From the U. S. Bureau of Mines, Reports of Investigations.

Specifications. Motor Gasoline Specifications Revised. Automotive Manufacturer, vol. 61, no. 9, Dec. 1919, pp. 18-20. Committee on petroleum specifications reports new end point, higher 90 per cent point, and elimination of all gravity references.

Revise Gasoline Specifications to Meet Commercial Needs. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 717-719. Former single standard, as adopted on Oct. 2, 1919, is reported as being redrafted with three grades under consideration as results of surveys made by Bur. of Mines covering about 800 samples of commercial fuel.

Revised Specifications for Motor Gasoline. Oil News, vol. 7, no. 22, Nov. 5, 1919, pp. 34-36. Promulgated by Presidential Committee on Standardization of Petroleum Products.

Substitutes. Alternatives to Motor Spirit. Petroleum Times, vol. 4, no. 82, July 31, 1920, pp. 131-132. Report of British Fuel Research Board.

New Gasoline Substitute an Alcohol Derivative. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 24 and 26. Fermogas, manufactured by Fermogas Corporation, New York. It is described as specially denatured alcohol wherein denaturizing agent is petroleum or coal tar derivative.

Oil Resources Limited, E. W. Dean. Chem. Engr., vol. 27, no. 12, Dec. 1919, p. 313. Possibilities of shale oil and alcohol as gasoline substitutes.

Survey in U. S. Internal-Combustion Engine Gasoline Survey, N. A. C. Smith. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 300-301. Curves showing how average distillation of gasoline samples secured from principal cities in U. S. in Bur. of Mines surveys compares with Government specification.

Synthetic. Tests of Synthetic Gasoline. Aviation, vol. 7, no. 11, Jan. 1, 1920, p. 479. Fuel is composed of 38 parts alcohol, 19 parts benzol, 4 parts toluol, 30 parts gasoline and 7½ parts ether. Tests are said to have indicated saving of 3.3 gal. of fuel an hour in favor of alcohol fuel.

GASOLINE ENGINES

Air Cooling of. The Air Cooling of Petrol Engines, A. H. Gibson. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 241-243, 8 figs. Account of cylinder design and construction and notes on cylinders with longitudinal fins, pistons, cylinder distortion and fan cooling. Paper read before Instn. Automobile Engrs.

Aluminum Pistons. Machining Aluminum Pistons, P. T. Lennon. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1175-1176, 3 figs. Tools used.

British Marine, Specifications. Individual Models of the British Marine Engine Builders, M. W. Bourdon. Automotive Industries, vol. 42, no. 20, May 13, 1920, pp. 1098-1105, 18 figs. Abbreviated specifications of British marine engines of gasoline and kerosene types, together with range of standard sizes, prices and weights.

Centrifugal Oil Cleaner. Experimental Centrifugal Oil Cleaner Attached to Liberty Engine. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 610-611, 3 figs. Device designed and developed by Installation Branch, Power Plant Section, and constructed in shops at McCook Field.

Ignition. The Relation of Time of Ignition to the Economy of the Gasoline Engine, J. P. Calderwood and A. J. Mack. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 390-391, 2 figs. Results of tests made at Engineering Experiment Station of Kansas State Agricultural College. It was concluded that (1) with other conditions constant, economical spark advance to be carried depends on fuel mixture and (2) with richer mixture and higher spark advance, maximum delivered hp. will be greater than can be secured with leaner mixtures and smaller spark advance.

Single-Cylinder, Manufacture of. The Manufacture of Single-Cylinder Gasoline Engines, J. V. Hunter. Am. Mach., vol. 52, nos. 21 and 24, May 20 and June 10, 1920, pp. 1079-1083, 15 figs. and 1237-1239, 10 figs. Practice of Filler &

Johnson Manufacturing Co., Madison, Wis. Special boring-mill tools for turning flywheels, and methods of grinding valves.

Slow-Running. The Limits of Slow Running, A. Johnson. Automobile Engr., vol. 10, no. 139, June 1920, pp. 231-232, 1 fig. Torque curve is constructed for four-cylinder engine running without load, and equations of velocities are computed from which it is found that minimum velocity on which engine can run with regularity is 145 r. p. m.

Tests. Investigations on a Small Single-Cylinder Stationary Engine, A. T. Evans. Automobile Engr., vol. 10, no. 136, Mar. 1920, pp. 90-96, 19 figs. Account of tests of stationary single-cylinder 5-9 hp. Webber engine designed to run at any speed up to 1100 r.p.m., conducted at Engine Patents Laboratory, Bridge Works, Shoreham, England.

Tolputt Slide-Valve. The Tolputt Slide-Valve Engine. Autocar, vol. 45, no. 1297, Aug. 28, 1920, pp. 371-372, 2 figs. Cylinder block with slide valve gear, intended to take place of ordinary poppet-valve cylinders on crankcase of existing engine.

Turner-Moore. New Engine Has Unusual Oil System and Valve Setting. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 946-947, 5 figs. Turner-Moore 3 1/3 x 5 in., four-cylinder general purpose engine. It develops 37 b.h.p. at 2200 r.p.m. Distinguishing features are hollow crankshaft and accentuated inclination of valves.

[See also AEROPLANE ENGINES; AUTOMOBILE ENGINES; TRACTOR ENGINES.]

GASOLINE PUMPS

Glass Top. A New Pump Manufactured by the Tokheim Company. Scale Jl., vol. 7, no. 1, Oct. 10, 1920, p. 10. Describes new pump called Victory No. 200, in which actual measure of gasoline as delivered is seen by customer through the clear glass graduated globe at top of pump and totaled by totaling meter.

GEAR CUTTING

Automobile Gears. Gear Cutting for Motor Cars, P. J. Worsley. Automobile Engr., vol. 10, no. 137, April 1920, pp. 162-169, 24 figs. Description of Fellows gear cutter, Sunderland bevel gear planer, gear hobbing machines manufactured by Reinecker & Wallwork Co. and other machines.

Bilgram Machine. Gear Production and the Method Involved in Cutting, Reginald Trautschold. Automotive Industries, vol. 42, no. 11, Mar. 11, 1920, pp. 658-664, 7 figs. Limitations of involute system are pointed out and principle upon which Bilgram generating machine operates is explained.

Double Helical Bevel Gears. Gear Cutting for Motor-Cars, P. J. Worsley. Machy. (Lond.), vol. 15, no. 391, Mar. 25, 1920, pp. 817-821, 7 figs. Sykes specification for double helical bevel generator.

Gear Shapers. Machining the Gear-Shaper Saddle, Douglas T. Hamilton. Am. Mach., vol. 53, no. 7, Aug. 12, 1920, pp. 293-295, 18 figs. Practice of Fellows Gear Shaper Co., Springfield, Vt.

New Gear-Shaping Machine. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 425-427, 4 figs. Designed for all classes of repetition work on internal and external gears or ratchets. Main frame is single casting bolted to circular cast base which can be mounted on bench or column.

Hobbing. Formulæ Used in Hobbing Large Prime Numbered Gears, A. Fisher. Machy. (Lond.), vol. 16, no. 415, Sept. 9, 1920, pp. 705-706. Formulæ used in calculations of change wheels for hobbing machines when cutting gears with large prime number of teeth.

Hobbing Machines. See HOBBING MACHINES.

Machines. Donaldson & Fisher Gear-Generating Machine, J. V. Hunter. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 831-832, 3 figs. Description and illustration of machine which is said to be very compact, will cut straight and helical gears, worms, wormwheels and will spline shafts.

See also Bilgram Machine; Gear Shapers; Spur-Gear Machine.

Sharpening Cutters. Sharpening Hobs and Cutters, Carl G. Olson. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 11-13, 14 figs. Points to be considered in obtaining good results in cutting of gears.

Spur-Gear Machine. New Spur Gear Generating Machine. Machy. (Lond.), vol. 16, no. 414, Sept. 2, 1920, pp. 684-685, 4 figs. Massive puncher slotting machines, in which bed and head are cast together to insure rigidity designed and constructed by William Muir & Co., Ltd., Manchester, England.

Triple Gears. Cutting Triple Gears with Accurate Tooth Alignment, Clayton C. Marsh. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 309-313, 11 figs. Methods employed to obtain accurate tooth alignment when cutting one-piece triple gears having spur and helical teeth of different diameters.

GEAR SHAPERS

See GEAR CUTTING, Gear Shapers.

GEARS

Automobile. Automobile Gear Making Centralized. Iron Age, vol. 106, no. 5, July 29, 1920, pp. 245-250, 10 figs. New works of General Motors Corporation. Well-lighted, single-room machine shop half acre in size and complete heat-treating plant with efficient routing of work.

Ball-Micrometer, Measurement of. Measurement of Gear Wheels with Ball Micrometer, W. H. Cowlin. Machy. (Lond.), vol. 15, no. 389, Mar. 11, 1920, pp. 762-763, 3 figs. Table intended to simplify calculations of distance between centers of balls.

Bevel. Chordal Thickness of Tooth and Corrected Pitch Depth of Bevel Gears, C. W. Mapes. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 169-170, 1 fig. Diagram showing dimensions and angles used in determining chordal thickness and corrected pitch depth of bevel gear teeth.

Generating Bevel Gears, Francis W. Shaw. Machy. (Lond.), vol. 16, no. 394, April 15, 1920, pp. 41-45, 4 figs. Discusses question whether or not root angle must correspond to pressure angle.

Calipers for. The "Sykes" Gear Tooth Caliper. Machy. (Lond.), vol. 16, no. 418, Sept. 30, 1920, pp. 804-805, 2 figs. Type of gear caliper that enables gear teeth to be gaged with one setting only.

Change, Design of. Designing Change Gears. Machy. (Lond.), vol. 15, no. 378, Dec. 25, 1919, pp. 381-384, 3 figs. Calculations involved in designing change gear mechanisms for machine tools so that speeds will vary in geometrical progression.

Designing Change-Gears, W. C. Steuart. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 252-255, 3 figs. Calculations involved in designing change-gear mechanisms for machine tools so that speeds will vary in geometrical progression.

Cutting. See GEAR CUTTING.

Design. Gear Teeth Sizes from the Standpoint of

Durability, Joseph Jandasek. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1305-1308, 4 figs. It is pointed out that all formulæ in current use for calculating gear teeth are based on breaking strength of teeth; but author makes the point that in case of gears for trucks, and especially for farm tractors, calculations should be based on resistance to wear of teeth.

The Manufacture and Design of Toothed Gearing, Joseph Chilton. Tran. North-East Coast Instn. Engrs. & Shipbuilders, vol. 35, part 3, May 1919, pp. 109-138 and (discussion) pp. 138-144, 18 figs. Toothed gearing considered is that used for transmission of motion between shafts whose axes are either parallel or at right angles to each other. Design formulæ for various types, including that used in De Laval turbine for speed reduction, are given.

Double Helical, Cutting. See MACHINE TOOLS, Double Helical Gears for.

Elliptic. The Manufacture of Elliptic Gears (Construction des engrenages elliptiques), P. Massot. Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 1-5, 4 figs. Milling method.

Epicyclic. The Almond Coupling. Automobile Engr., vol. 11, no. 142, Sept. 1920, pp. 376-377, 4 figs. Notes on crank-motion epicyclic gears.

Friction Losses. Friction Losses in Gears (Pertes par frottement dans les engrenages), M. Sabathier. Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 4-5, 3 figs. Formulæ.

Heat Treatment of. Heat Treatment of Gears a Dependable Operation. Iron Age, vol. 106, no. 6, Aug. 5, 1920, pp. 314-315, 2 figs. Discussion of hump process. Effects of different heating rates. Operating costs.

Treatment of Gears by "Hump" Process, G. W. Tall. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 388-390, 2 figs. Discussion of principles involved, type of equipment required and advantages of process. Effects of different heating rates and actual cost of heating by "hump" method.

Helical. Calculation of Helical Gears with Axes at Right Angles (Calcul des engrenages hélicoïdaux à axes rectangulaires), Jean Bertrand. Vie Technique & Industrielle, vol. 1, no. 12, Sept. 1920, pp. 489-494, 8 figs. Formulæ and graphs for designing such gears.

The Helical Gear, Its Design and Application. Can. Machy., vol. 23, nos. 11 and 12, Mar. 11 and 18, 1920, pp. 263-269, 8 figs., and 287-291, 8 figs. Application of helical twisted teeth to gears operating on parallel axes, together with data on design, application and production.

See also Double Helical; REDUCTION GEARS, High-Speed.

Helical, Patterns for. Pattern Making and Molding of Helical Gears, F. H. Bell. Can. Foundryman, vol. 11, no. 6, June 1920, pp. 144-145, 6 figs. A good way is said to be to turn up a block of wood of proper length, diameter of which will be that of gear at base or root of the teeth; if many gears are to be made, a stripping plate can be used to advantage, as it will assist molder in drawing pattern.

Herringbone. See MACHINE TOOLS, Herringbone Gears for.

Hindley Worm. See Worm.

Horsepower Charts. A Horsepower and Torque Chart, John S. Watts. Am. Mach., vol. 53, no. 4, July 22, 1920, p. 191, 1 fig. Chart for determining sizes of gears or pulleys required to transmit given horsepower at speed given in revolutions per minute.

Horsepower Chart for Gear Teeth, William W. Gaylord. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 62-63, 1 fig. Chart from which horsepower transmitted by gear can be read when load is known.

Intermittent-Motion. A Mutilated Gear Feed, William Gumprich. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 250-252, 3 figs. Modification of Geneva stop.

Internal. Design and Calculation of Williams Internal Gearing. Machy. (Lond.), vol. 15, no. 369, Oct. 23, 1919, pp. 106-111, 5 figs. In this system profiles of internal gear teeth are straight lines, so that tooth spaces are similar to those of an involute rack, while teeth of mating pinion have curved profiles of conjugate form.

Reducing Internal Gear Limitations, Reginald Trautschold. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 724-727, 4 figs. Description of Williams gear.

Involute. Interference of Involute Spur-Gear Teeth, A. B. Cox. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 707-708, 2 figs. Formula expressing relation between gear ratio, number of teeth in pinion and interference.

The Involute Gear, Francis W. Shaw. Machy. (Lond.), vol. 16, nos. 405, 407 and 412, July 1 and 15 and Aug. 19, 1920, pp. 388-392, 450-453 and 630-632, 14 figs. July 1: Results of an inquiry made concerning new form of gear tooth, the patented tooth. Reasons for departure from the standard involute are given and obliquity is also discussed. July 15: Relation of tooth form to line of action and effect of varying cutting depth and center distances. Aug. 19: Argument against contention of A. Fisher (see Machy., pp. 388 and 517) that Fisher gear reduces pressure.

Manufacture. Gear Makers Adopt Standard Contract. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 830-831 and 833. Form drawn by Committee of Am. Gear Manufacturers' Assn.

Gear Manufacture—Types and Materials. Raw Material, vol. 1, no. 8, Nov. 1919, pp. 377-384, 18 figs. Materials for noiseless operation of gears.

Greater Efficiency in Centralized Gear Making. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 14-19, 9 figs. Manufacture of automotive gears in plant comprising central specialized forge, gear, axle and power units.

Patterns. Gear Patterns, Joseph I. Shelly. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 429-432, 10 figs. Methods of laying-out and constructing patterns for spur and bevel gears and worm wheels.

Planer-Driving. Designing Planer Driving Gears, W. C. Steuart. Machy. (Lond.), vol. 16, no. 408, July 22, 1920, pp. 485-489, 1 fig. Methods used in proportioning planer driving gears, and tables giving dimensions of various planer drives.

Quantity Production. Making Gears on Quantity Basis, John D. Knox. Iron Trade Rev., vol. 66, no. 24, June 10, 1920, pp. 1679-1682 and 1684, 7 figs. New plant of Dittmer Gear & Mfg. Corp., which was built under adverse conditions, now is producing 2400 gears daily. How obstacles in plant construction were overcome.

Reduction. See REDUCTION GEARS.

Sprocket Wheels. See SPROCKET WHEELS.

Spur-Gear Testing Machine. Gear-Testing Machine, G. Wirrer. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 633-635, 8 figs. Description of a machine designed to test spur gears for accuracy of tooth profile and concentricity.

Spur, Patterns for. How Spur Gear Patterns are Made, Joseph Horner. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 645-648, 13 figs. Methods for laying out material and afterward joining

it together to facilitate molding and prevent distortion of patterns while they are in use.

See also PATTERNS, Gear.

Steel for. See STEEL, Gear.

Teeth, Strength of. Strength of Gear Teeth, S. J. Berard. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 925-927, 3 figs. Tables and diagrams for determining force which given pair of gears will transmit and pitch necessary to transmit given force when speed is known.

Testing Machines. Gear-Testing Machine. Machy. (Lond.), vol. 15, no. 392, Apr. 1, 1920, pp. 862-864, 8 figs. Machine designed to test spur gears for accuracy of tooth profile and concentricity. Principle on which machine operates is comparison of rolling action of pair of gears under test with rolling action of two circular disks, result being recorded on chart.

Machines for Testing Gears (Machine à essayer les engrenages). Technique Automobile et Aérienne, vol. 10, no. 110, 1920, pp. 67-69, 7 figs. Mechanism for comparing gears with untoothed disks.

Spur and Bevel Gear Testing Machine at the National Physical Laboratory, T. E. Stanton. Eng., vol. 109, no. 2828, March 12, 1920, pp. 334-335, 7 figs. Also describes Daimler-Lanchester worm-gear testing machine for direct measurement of ratio of torques of driving and driven shafts.

Tumbler. The Design of Tumbler Gears. Machy. (Lond.), vol. 16, no. 406, July 8, 1920, pp. 417-419, 16 figs. Examples of spur and worm tumbler arrangements.

Warpage in Heat-Treating. Discussion on Warpage of Gears During Heat Treating Operations. Proc. Steel Treating Research Soc., vol. 2, no. 11, 1920, pp. 20-24, and p. 55. Opinions expressed by various manufacturers.

Williams Internal. See Internal.

Worm. An Improved Worm Gear. Automobile Engr., vol. 9, no. 133, Dec. 1919, p. 449, 2 figs. F. J. type said to have developed over 97 per cent efficiency in tests at Nat. Phys. Laboratory.

The Story of the Hindley Worm Gears, H. Fleckenstein. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1005 and 1015. Together with exposition of claimed advantages of Hindley gears over ordinary straight worm gears.

See also SCREW THREADS, Worm-Gear.

Worm, Lubrication of. The Lubrication of Worm Gear. Motor Traction, vol. 29, no. 770, Dec. 3, 1919, pp. 543-545. Also Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1016-1018, 2 figs. Tests made at National Physical Laboratory for determining lubricating qualities of various classes of oil.

GELATINE

Jellying Power. See GLUES, Jellying Power.

GEOLOGY

Australia. On a Shell-bed Underlying Volcanic Tuff Near Warrnambool; with Notes on the Age of the Deposit, Fredk. Chapman and Chas. J. Gabriel. Proc. Roy. Soc. Victoria, vol. 30, no. 1, Sept. 1917, pp. 4-14. Bed is believed to belong to same episode as older dune-rock accumulations of that locality.

Divining Rods and. Relation Between the Action of the Divining Rod and the Geological Peculiarities of Subsoil (Der Zusammenhang von Wünschelrutenwirkung und geologischen Besonderheiten des Untergrundes), R. Ambronn. Glückauf, vol. 55, nos. 46 and 47, Nov. 15 and 22, 1919, pp. 893-897 and 913-917, 3 figs. Writer refers to revival of ancient and long-discredited use of divining rods. The relation between divining-rod and geological surveys in two large areas is indicated with the aid of charts, and the practical importance of such relationship for geologists and mining engineers is emphasized.

Iowa. The Hackberry Stage of the Upper Devonian of Iowa, Carroll Lane Fenton. Am. Jl. Sci., vol. 48, no. 287, Nov. 1919, pp. 355-376, 6 figs. Series of shales, limestones and dolomitic beds, resting upon bluish, clayey shale, described as comprising distinct stage characterized by rich and prolific fauna.

North America. Bibliography of North American Geology for 1918 with Subject Index, John M. Nickles. Dept. Interior, U. S. Geological Survey, Bul. 698, 1919, 148 pp. Including petrology and mineralogy.

Ordovician Formations, Pennsylvania. The Middle Ordovician of Central and South Central Pennsylvania, Richard M. Field. Am. Jl. Sci., vol. 48, no. 288, Dec. 1919, pp. 403-428, 3 figs. This province is considered as most Western extension of ordovician formations of State and to occupy middle and somewhat isolated position within ordovician terranes of eastern North America.

Pre-Cambrian Period. Pre-Cambrian and Carboniferous Algal Deposits, W. H. Twenhofel. Am. Jl. Sci., vol. 48, no. 287, Nov. 1919, pp. 339-352, 5 figs. Suggested method of origin of deposits of laminated type occurring in Lower Huronian of Michigan and in Pennsylvania and Permian of Kansas and Oklahoma.

Subsurface Structure Determination. Method for Projecting Structure Through an Angular Unconformity, Clifton S. Corbett. Economic Geology, vol. 14, no. 8, Dec. 1919, pp. 610-618, 4 figs. It is advanced that subsurface structure derived by projection of surface structure will give nearest approach to actual conditions in lower uncomfortable series of beds that can be obtained in advance of drilling. It is therefore concluded that most favorable locations for first tests in localities where there is some surface structure can be picked from consideration of corresponding projected structure in lower series.

Sulphates in Ore Deposits. Primary (Hupogène) Sulphate Minerals in Ore Deposits, B. S. Butler. Economic Geology, vol. 14, no. 8, Dec. 1919, pp. 581-609, 2 figs. From experimental investigation it is concluded that some of the metals which at high temperature are combined with oxygen as temperature is reduced give up oxygen and both metals and oxygen combine with sulphur producing sulphates of metals and oxides of sulphur.

Transverse Displacements in Mountain Folds. Origin and Growth of Transverse Displacements in Mountain Folds (Ueber Verlauf und Entstehung von Querstörungen in Faltengebirgen), H. Quiring. Zeitschrift für das Berg-Hütten u. Salinenwesen, vol. 67, no. 3, 1919, pp. 133-142, 3 figs. Information derived from the Rhenish-Westphalian anthracite mines.

[See also IRON DEPOSITS, Gogebic Range; OIL FIELDS, Geology; ORE DEPOSITS; ROCK.]

GEOMETRY

Dirichlet's Problem. Dirichlet's Problem for an Infinite Domain (Sur le problème de Dirichlet pour un domaine infini), Georges Bouligand. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1020-1023. Case when boundary of sphere admits, at any point within finite distance of center, tangent plane varying continuously.

Non-Euclidean. Erroneous Theorem in Non-Euclidean Geometry of the Triangle (Un teorema erróneo en la geometria no euclidiana del triángulo), Julio Rey Pastor. Contribución al

estudio de las ciencias, fisicas y matemáticas, Universidad Nacional de la Plata, no. 38, Dec. 1918, pp. 253-259, 1 fig. Argument against F. Schur's proposition in Grundlagen der Geometrie, Leipzig, 1910, concerning cases in which orthocenter, baricenter and circumcenter of a triangle are in a straight line.

GEOPHONES

Uses. Observations with Geophones at Mines, Alan Leighton. Coal Industry, vol. 3, no. 5, May 1920, pp. 235-237. Satisfactory results, it is said, have been obtained in attempts made to locate leaks in water mains.

[See also COAL MINES, Fires, Location of.]

GERMAN INDUSTRIES

Coal, Iron and Steel. The German Coal, Iron and Steel Industries. Iron & Coal Trades Rev., vol. 99, no. 2696, Oct. 31, 1919, pp. 564. Economic conditions. From statements published in German newspapers.

GILDING

Use of Gas in. The Use of Gas in Connection with Gilding on Common China and Other Substances, Gilbert C. Shadwell. Am. Gas Eng. Jl., vol. 112, no. 23, June 5, 1920, pp. 437-440. It is pointed out that gilding is done, as a rule, by two main methods, one being by an adhesive varnish and other by means of heat or sometimes by a combination of the two. Notes on embossing and gilding on glass, gilding metals, etc., gilding of cotton, and coloring of gold.

GIRDERS

Axial and Transverse Loads. Calculation of Girders Under Simultaneous Axial and Uniformly Distributed Transverse Loads (Berechnung achsial- und gleichförmig querbelasteter Träger), Julius Ratzersdorfer. Zeitschrift des Oestrr. Ingenieur- u. Architekten-Vereins, vol. 71, no. 43, Oct. 24, 1919, pp. 393-395, 8 figs. Process of calculation is propounded based on Clapeyron 3-moment equation.

Buckling of. The Buckling of Framed Girders (Die Durchbiegung der Rahmenträger), E. Elwitz Zeitschrift für Bauwesen, vol. 69, no. 10-12, 1919, pp. 703-742, 35 figs. Investigation of girders with polygonal chords as a supplement to work published in same journal (no. 10-12, 1916) on buckling of girders with parallel chords. Tables and formulæ are given for all forms of polygonal girders, half-parabolic and parabolic girders with two symmetrical axes, lattice girders, etc.

Lattice, Rolling Load Diagram. Simple Stress Diagram for Rolling Loads, Norman G. Kapp. Engineering, vol. 109, no. 2819, Jan. 9, 1920, p. 35, 5 figs. Calculated for lattice girder of eight panels of 10-ft. each.

Plate, Rivet Pitch in. Finding Rivet Pitch in Plate Girders Quickly, Ralph Smillie. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, p. 157, 1 fig. Rivet-pitch diagram for plate-girder flanges, with two lines of ⅞-in. rivets. Bearing value of 24,000 lb. per sq. in. is assumed.

Reinforced-Concrete. Constructing a Massive Proscenium Girder in Toronto's Largest Theater, F. E. Brown. Contract Rec., vol. 34, no. 6, Feb. 11, 1920, pp. 122-124, 5 figs. Reinforced-concrete girder 51-ft. in span, 13-ft. deep and 2 ft. 2 in. wide. Mix used was 1:2:4 stone concrete and reinforcement consisted of eighteen 1½-in. round bars with ¾-in. stirrups at 12-in. centers.

Determination of the Most Economic Reinforcement of Double-Reinforced Slabs and Girders (Die Bestimmung der wirtschaftlich günstigsten Armierung doppelt armierter Platten und Balken), H. Lührs. Armierter Beton, vol. 12, no. 12, Dec. 1919, pp. 315-317, 1 fig. Equations and chart for computing required reinforcement.

The Design of a Long-Span Reinforced Concrete Girder, A. E. Wynn. Eng., vol. 109, no. 2841, June 11, 1920, pp. 777-778, 13 figs. Suggestions for effecting economical design.

[See also BEAMS.]

GLASS

American Industry. The American Glass Industry, E. E. Sullivan. Chem. Engr., vol. 27, no. 11, Nov. 1919, pp. 281-283. Growth during war. Paper read at Fifth Exposition of Chem. Industries, Chicago.

Ampuls. The Selection of Glass for the Manufacture of Ampuls, George E. Ewe. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 649-653. Tests are suggested.

Annealing. Concerning the Annealing and Characteristics of Glass, A. Q. Tool and J. Valasek. Sci. Papers Bur. Standards, no. 358, Jan. 31, 1920, pp. 537-571, 19 figs. Certain methods for determining the annealing range were tested and "annealing temperatures" obtained are given for number of optical glasses. Critical temperature range for these glasses was determined. It was confirmed that in this range there is apparent absorption of heat on heating and corresponding evolution of heat on cooling, as well as marked change in number of properties of glass. It is advised to anneal at temperature somewhat below this range.

Automobile Uses. See AUTOMOBILES, Glass, Uses in.

Birefringence. The Relation Between Birefringence and Stress in Various Types of Glass, L. H. Adams and E. D. Williamson. Jl. Wash. Acad. Sci., vol. 9, no. 20, Dec. 4, 1919, pp. 609-623, 4 figs. Results obtained by loading blocks of glass in test machine and measuring concomitant birefringence. For all of glasses studied except heavy flint, thrust of 1 kg. per sq. c.m. produced power difference of 2 to 3 $\mu\mu$ per c.m. thickness of glass.

Characteristics. See Annealing.

Chemical Analysis. Chemical Assays of Glasses (Étude sur les essais chimiques des verres), Ch. Griffiths. Bulletin du Laboratoire d'Essais mécaniques, physiques, chimiques et de machines du Conservatoire National des Arts et Métiers, no. 17, 1917, 48 pp., 3 figs. Methods of performing quantitative analysis of various elements.

Effects Due to Additions. Glass and Some of Its Problems, Herbert Jackson. Journal of the Royal Society of Arts, vol. 68, no. 3504, Jan. 16, 1920, pp. 134-146. Effects produced by addition of various elements.

Expansion at High Temperatures. The Expansion of Glass at High Temperatures, W. B. Pietenpol. Physical Rev., vol. 15, no. 6, June 1920, pp. 520-521. Direct microscope method for determining expansion of different kinds of glass.

Glauber's Salt. The Use of Specially Purified Glauber's Salt for the Manufacture of First-Grade Crystal Glass (Die Verwendung von besonders gereinigtem Glaubersalz zur Herstellung von Ia. Kristallglas), K. Killer. Sprechsaal, vol. 53, no. 10, Mar. 4, 1920, pp. 93-94. Writer claims that by experimental smelting of a very pure Glauber salt from the firm of Knothe & Fritsche, Bodenbach, he obtained a very pure glass.

Hardness. Calculation of the Hardness and Expansion of Glass (Berechnung der Härte bezw. Ausdehnung des Glases), Ludwig Springer. Sprechsaal, vol. 53, no. 19, May 6, 1920, pp. 193-196. Gives approximate calculations which, in writer's opinion, should aid in elimination

of gross mistakes. Expansion of glass is said to be dependent on composition of the glass—that is, on kind and quantity of the separate component parts.

Joints to Metal. Glass to Metal Joints, E. C. McKelvy and C. S. Taylor. Jl. Am. Chem. Soc., vol. 42, no. 7, July 1920, pp. 1364-1374, 2 figs. Methods for construction of two types of metal-to-glass joints are given, together with results of tests upon their behavior on handling, their vacuum tightness, and their resistance to internal pressure.

Lead. The Comparative Effects of Soda and Potash in Lead Glass for Table Ware, F. W. Hodkin and W. E. S. Turner. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 120-125. Methods of preparing and testing three series of lead-soda, lead-potash, and lead-soda-potash glasses of commercial value. Lead-soda glasses melted most readily and lead-potash least readily. Lead-potash glasses showed greatest viscosity and lead-soda least.

Lime-Soda. The Optical Properties of Some Lime-Soda Glasses, J. R. Clarke and W. E. S. Turner. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 111-115, 1 fig. Measurements of refractive index. It is concluded that replacement of soda molecularly by lime results in steady increase in refractive index for all lines of light used; also that refractive index increases more or less as density increases.

Manufacture. See GLASS MANUFACTURE.

Optical. See GLASS, OPTICAL.

Plates, Plane Parallelism of. Apparatus for the Testing of Glass Plates for Plane Parallelism (Apparat zut Untersuchung von Glaaplatten auf ihre Planparallelität), Hugo Krüss. Zeitschrift für Instrumentenkunde, vol. 40, no. 2, Feb. 1920, pp. 33-37, 2 figs. Refers to the Plath and Eylert apparatus and describes design and manipulation of device developed by author for investigation of large glass plates up to 12 by 12, whereby every part of plate is accessible for investigation.

Research. Laboratory in Chicago Makes Progress in Research for Makers and Users of Glass Containers, J. M. Hammer. Glassworker, vol. 40, no. 1, Oct. 2, 1920, pp. 11-12, 1 fig. Work being done in Chicago research laboratory of Glass Container Association of America.

Silica. Silica Glass. Chem. Age (Lond.), vol. 3, no. 65, Sept. 11, 1920, pp. 280-281, 1 fig. Physical and chemical properties. Translated from Chimie & Industrie.

Soda-Lime. The Density of the Soda-Lime Glasses, S. English and W. E. S. Turner. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 126-128. Results of measurements, together with calculated densities based on Winkelmann and Schott's factors.

See also Lime-Soda.

Soda-Magnesia. The Density of Soda-Magnesia Glasses, S. English and W. E. S. Turner. Jl. Soc. of Glass Technology, vol. 4, no. 14, Aug. 1920, pp. 153-156, 2 figs. Graph showing results obtained experimentally for both lime- and magnesia-containing glasses, densities in each case being plotted against molecular percentage composition. In both cases relationship between density and composition is linear, deviation occurring being at end of series only.

The Thermal Expansion of Magnesia-Containing Glasses, S. English and W. E. S. Turner. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 115-120, 1 fig. Thermal expansions of series of soda-magnesia glasses were determined for temperature range from 25 to 90 deg. cent. Coefficients of expansion were found to be additive property of composition. Replacement of soda by magnesia in glass caused rapid diminution in thermal expansion.

Tests of. Comparison Tests for Striae in Optical Glass, by the Braschear Converging Light, Direct View Method, the Bureau of Standards Tank Immersion Method, and the Short Range Projection Method, L. E. Dodd. Jl. Am. Ceramic Soc., vol. 2, no. 12, Dec. 1919, pp. 977-1006, 5 figs. Short-range projection method was found to compare favorably with others, and it is, therefore, pronounced acceptable for regular use for instruments for optical glass with striae even with ground surfaces and white light.

Tubing, Discoloration of. The Discoloration Produced by Lead, Antimony and Arsenic in Lamp-worked Glass Tubing, F. W. Hodkin and W. E. S. Turner. Jl. Soc. of Glass Technology, vol. 4, no. 14, Aug. 1920, pp. 158-161. Results showed that both arsenious and antimony oxide are very potent in causing discoloration when glass is worked in flame, far more so than lead oxide. Minimum amount of arsenious and antimony oxides required to be present in glass to yield discoloration lies between 0.02 and 0.05 per cent; for lead oxide 0.6 per cent is required.

Ultra-Violet Transmission of. The Ultra-Violet and Visible Transmission of Various Colored Glasses. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 148, Mar. 19, 1920, 27 pp., 26 figs. Spectral transmission curves for 87 samples of glass representing over 50 different kinds, mostly colored, are given, mostly of American manufacture, but comparison is afforded with samples of Jena glass obtained before the war. Practical uses are indicated, such as ultra-violet signaling, railway signaling, protection of eyes, etc.

Viscosity. A Factory Method for Measuring the Viscosity of Pot-made Glass during the Process of Manufacture Together with some Discussion of the Value of Viscosity Data to the Manufacturer, Edward W. Washburn. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 735-745 and (discussion) pp. 745-749, 3 figs. Apparatus used for measuring viscosity by "stirring method."

Weathering of. Note on the Mechanics of the "Weathering" of Glass, F. R. v. Bichowsky. Jl. Am. Ceramic Soc., vol. 3, no. 4, April 1920, pp. 309-312, 1 fig. Theory is outlined for explaining weathering of glass with water.

Wired, as Fire Retardant. Wired Glass as a Fire Retardant, M. L. Carr. Fire & Water Eng., vol. 66, no. 26, Dec. 24, 1919, pp. 1217-1218. Also in Safety Eng., vol. 39, no. 1, Jan. 1920, pp. 4-6. Experience is said to have shown that wired glass is perfect barrier to flame so long as it remains in position and that it is capable of affording moderate degree of resistance to passage of heat through it.

GLASS INDUSTRY

Research. Putting the Glass Industry on a Scientific Basis, E. Ward Tillotson. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 461-465, 4 figs. Role of modern science in ancient art of glassmaking. Developments due to engineering. Refractories and raw Materials. Accomplishments of chemist.

GLASS MANUFACTURE

Furnace Refractories. See REFRACTORIES, Glass-Furnace.

Furnaces. Glass Furnaces (Der Glasschmelzofen). Sprechasaal, vol. 53, no. 7, Feb. 12, 1920, pp. 66-67. Suggestions for reducing consumption of fuel. Of the two systems described, the recuperative and regenerative systems, the latter is said to consume less fuel and is therefore more generally used.

On a New Type of Gas-Fired Furnaces, Mor-

ris W. Travers. Jl. Soc. of Glass Technology, vol. 4, no. 14, Aug. 1920, pp. 205-225, 2 figs. Operation of Dennis Simplex furnaces.

Fusing Glass Sand, Methods of. Commercial Development of Fused Silica, John Scharl and Wallace Savage. Chem. & Met. Eng., vol. 22, no. 13, Mar. 31, 1920, pp. 593-595, 4 figs. Account of development of electrothermal processes of fusing glass sand, together with expositions of reactions taking place between carbon and silica and application of gas phases to process.

Glass Pots. A Suggested Improvement in the Manufacture of Glasshouse Pots, C. W. Thomas. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 107-111, 3 figs. Device to enable interior surface of pot to be worked upon when in a hard and toughened condition.

Note on Porcelain Glass Pot Mixtures, D. H. Fuller. Jl. Am. Ceramic Soc., vol. 3, no. 7, July 1920, pp. 569-573 and (discussion) 574, 2 figs. Deals with pot compositions of porcelain type and coarser texture than ordinary commercial pot bodies. Gives tests of most important physical properties.

The Art of Pot Making, Chas. O. Grafton. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 653-662, 9 figs. Methods and operations necessary in manufacture of clay pot for melting glass.

Lime, Effect of. The Choice of Glass Batches Containing Lime, W. E. S. Turner. Jl. Am. Ceramic Soc., vol. 3, no. 5, May 1920, pp. 379-383. Results of tests are recorded in tabular form, in which effect of several reagents is measured by loss in weight suffered by each 100 sq. cm. of surface. It is noted that water is most corrosive liquid when either no lime or very little is present, while strong caustic alkali has least effect; also that as amount of lime is increased, corrosive action very rapidly falls off. From Department of Glass Technology, University of Sheffield, Eng.

Producer Gas in. See GAS PRODUCERS, Glass-Works Plant.

Sand for. Glass-Sand Resources of Virginia, Thomas L. Watson. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 794-803. Kinds of silica found in Virginia in quantity and of sufficient purity to be utilized in making glass are said to be: (1) quartz sand, (2) sandstone and quartzite, and (3) vein quartz including some pegmatite occurrences. Description and character, including analysis of these materials, are summarized.

Silica Rock and Sand for Glass Making, F. Gelstharp. Rock Products, vol. 22, no. 22, Oct. 25, 1919, pp. 29-30. Limiting amounts of impurities, size of grains, etc., for different grades and kinds of glass.

Stirrers. Note on the Motion of the Stirrers Used in Optical Glass Manufacture, E. D. Williamson and L. H. Adams. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 671-677. Analytical study of shape of curve traced by business end of stirrer, variation in velocity of stirrer at different parts of curve, and area of curve traced in relation to surface area of glass in pot.

GLASS, OPTICAL

Imperfections in. Optical Conditions Accompanying the Striae Which Appear as Imperfections in Optical Glass, A. A. Michelson. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 333, March 20, 1919, pp. 41-45, 4 figs. Examination of specimens. It is concluded that isolated striae are of no more importance than are bubbles found in some of best telescope objectives.

Manufacture and Uses. The Manufacture and Uses of Rolled Optical Glass, H. S. Roberts and J. C. Hostetter. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 750-761, 6 figs. Methods of manufacture and inspection are described and discussion is given for manner of forming glass into blanks for lenses and prisms.

See also GLASS MANUFACTURE, Stirrers.

Pots, Casting. The Casting of Pots for Use in Experimental Work on Optical Glass, Alice B. Taylor. Jl. Soc. of Glass Technology, vol. 4, no. 14, Aug. 1920, pp. 140-150 and (discussion) pp. 150-153, 10 figs. partly on 5 supp. plates. Advantages of casting compared with modeling or handmolding.

Properties. The Influence of Stress on the Properties of Optical Glass (Ueber den Einfluss der Spannung auf die Eigenschaften des optischen Glases), G. Berndt. Zeitschrift für Instrumentenkunde, vol. 40, nos. 3 and 4, Mar. and Apr. 1920, pp. 56-61 and 70-75, 1 fig. Notes on elasticity modulus, refraction index and density, expansion coefficient, etc. Results of experiments show that the determination of all constants in glass can be made only on carefully cooled pieces, as otherwise variations in strength, elasticity modulus and expansion coefficient up to 15 per cent can easily occur.

Striae in. Characteristics of Striae in Optical Glass, T. T. Smith, A. H. Bennett, and G. E. Merritt. Sci. Papers, Bur. of Standards, no. 373, May 3, 1920, 91 pp., 19 figs. Different methods, varying in sensitiveness are described for revealing presence of striae and corresponding photographic illustrations are given. It is shown that striae have refractive index in some cases larger, in other smaller than surrounding glass by as much as three or four in fourth decimal place, but usually about two.

Technology of. The Development of Various Types of Glass, G. J. Peddle. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 3-107, 11 figs. Technology of glass manufacture, divided into five parts: (1) Interaction of silica with oxides of sodium and potassium; (2) interaction of silica with silica, lime, and sodium oxide; (3) interaction of silica, lime, and potassium oxide; (4) interaction of silica, lime, and oxides of sodium and potassium; and (5) comparison of soda-lime-silica and potash-lime-silica glasses.

Weathering Tests. A Practical Test for the Resistance of Optical Glass to Weathering, F. R. v. Bichowsky. Jl. Am. Ceramic Soc., vol. 3, no. 4, April 1920, pp. 296-304 and (discussion), pp. 304-308, 1 fig. Results of weathering tests on optical glass by various methods.

GLASSWARE

Standardization. The Standardization of Chemical Glass Utensils (Zur Normierung der chemischen Glasgeräte), Fritz Friedrichs. Zeitschrift für angewandte Chemie, vol. 33, nos. 50, 52 and 54, June 22, 29 and July 6, 1920, pp. 151-156, 157-159 and 163-168, 73 figs. Report of expert group for chemical apparatus, giving standards and tolerances for cocks, funnels, gas containers, filter vessels, distillation vessels, etc.

Testing. Laboratory Resistance Glassware. Chem. Trade Jl., vol. 67, no. 1731, July 24, 1920, pp. 109-110. Scheme for testing laboratory glassware recommended by Glass Research Committee of Inst. of Chem.

GLASSWARE INDUSTRY

American, Present Status. Present Status of American Glassware, E. C. Sullivan. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 29-30. Contrasting pre-war contribution of America to progress of glassware industry with her contribution during the war and since writer notes that whereas before the war American glassware industry was limited mostly to

art-glass, selenium-red and other color glass and low-expansion glass, it now is extended to manufacture of glass and glassware for all practical, industrial and scientific uses.

GLUES

Aeroplane. Experiments with Hot and Cold Glue (Versuche mit Warm- und Kaltleim), H. Franz. Dingler's polytechnisches Jl., vol. 335, no. 12, June 1920, pp. 136-138, 4 figs. Results of experiments with casein glue which, it is said, was used exclusively during war in construction of army aeroplanes because of its greater resistance to water as compared with leather and bone glues. Other advantages of casein glue are said to be rapid application and immediate use in cold state, saving of heating appliances and steam or other means of heating.

Glues Used in Airplane Parts. Nat. Advisory Committee for Aeronautics, report no. 66, 1920, 28 pp., 3 figs. Glues are divided into five types: Animal glues; liquid glues; vegetable glues; casein glues; and blood albumin glues. Manufacture, preparation and application of each of these types is discussed.

Casein. The Influence of the Method of Manufacture on the Use of Casein in Glue Making, Samuel Butterman. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 141-144, 2 figs. It is determined that variation in behavior of casein made by different methods when used in water-resistant glue is due to variation in ash content. It is stated that it is possible to plot "glue characteristic curve" for any casein-glue formula by means of which uniform production of glue from casein made by any of commercial methods can be insured.

Jellying Power. Determination of the Jellying Power of Gelatins and Glues by the Polariscope, C. R. Smith. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 878-881, 1 fig. Results of investigation at Food Investigation Laboratory, Bureau of Chemistry, Department of Agriculture, Washington, D. C.

Properties. Properties and Constitution of Glues and Gelatines, Robert H. Bogue. Chem. & Met Eng., vol. 23, nos. 1, 2, 3, 4 and 5, July 7, 17, 21, 28 and Aug. 4, 1920, pp. 5-12, 61-66, 105-109, 154-158 and 197-203, 24 figs. Study of factors influencing viscosity and jell strength. Relations between physical properties and chemical constitution and influence of size of molecule upon physical constants. Physical and chemical significance of "craze." It is concluded from experiments that strength of glue in service is function of jell strength, viscosity, and melting point. Melting-point method for evaluation of glues is suggested. Bibliography of manufacture, physical properties and tests of glues and gelatines is appended.

Tensile Strength. Determination of the Tensile Strength of Glue, George Hopp. Jl. Indus. & Eng. Chem., vol. 12, no. 4, Apr. 1920, pp. 356-358, 1 fig. Method suggested consists in melting glue, pouring into molds, drying, cutting into strips of definite size, and obtaining strength and stretch by pulling on tensile machine.

Water-Resistant. Testing Water Resistant Plywood Glues, Clyde H. Teesdale and R. A. Colgan. Aviation, vol. 7, no. 6, Oct. 15, 1919, pp. 264-265, 3 figs. Methods developed by Forest Products Laboratory.

GLYCERIDES

Hydrogenation. See CATALYSIS, Hydrogenation of Fats.

GLYCERINE

From Sugar. Further Investigations of the Correlative Formation of Acetaldehyde and Glycerine by Decomposition of Sugar and New Contributions to Theory of Alcoholic Fermentation (Weitere Untersuchungen über die korrelative Bildung von Acetaldehyd und Glycerin bei der Zuckerspaltung und neue Beiträge zur Theorie der alkoholischen Gärung), Carl Neuberg und Elsa Reinfurth. Berichte der deutschen chemischen Gesellschaft, vol. 52, no. 8, Sept. 27, 1919, pp. 1677-1703. Writers explain that in 1913 a new theory of alcoholic fermentation was developed by C. Neuberg and J. Kerb, giving pyroracemic acid or acetaldehyde as important factor, and later confirmations of this theory are referred to. Tests are presented which, it is claimed, further confirm theory, and it is added that general importance of acetaldehyde in biochemic conversion of hydrogen-free substances was unexpectedly revealed.

GOLD

Production, South Africa. Rand Ore Reserves, A. Cooper Key. Eng. & Min. Jl., vol. 108, no. 18, Nov. 1, 1919, pp. 723-725, 1 fig. Analysis of gold mines made upon basis of present economic conditions, showing decrease in tonnage and account of higher working costs.

Recovery from Magnetic Black Sand. Recovery of Gold from a Magnetic Black Sand, John A. Davis and John Gross. Reports of Investigations, Bur. of Mines, serial no. 2158, Aug. 1920, 5 pp. Tests made by Alaska section of Bur. of Mines.

GOLD DEPOSITS

Australia. Hampton Plains Goldfield, W. A., T. Butement. Chem. Eng. & Min. Rev., vol. 12, no. 140, May 5, 1920, pp. 281-286, 2 figs. Remarks on geological and recent discoveries of good gold-bearing ore bodies in the Celebration and Mutooroo mines.

Canada. The Porcupine Goldfield, Ontario, J. Mackintosh Bell. Min. Mag., vol. 23, no. 3, Sept. 1920, pp. 139-149, 7 figs. Said to be probably the most promising gold district in world. Notes on topography, geology and origin of deposits; the principal mines of which the Hollinger is most important; metallurgical practice; hydroelectric power. Table showing gross value of entire production from various mines of district together with dividends paid up to end of 1918.

Nicaragua. New Mining Fields in Eastern Nicaragua, Louis Garbrecht. Eng. & Min. Jl., vol. 109, no. 14, Apr. 3, 1920, pp. 791-797, 5 figs. Low-grade gold ores present in quantities. Railroad, new ore-treatment methods and large-scale operations are necessary for profitable production.

GOLD METALLURGY

Amalgamation. Can Amalgamation be Dispensed With? E. M. Weston. Jl. Chem. Metallurgical & Min. Soc. of South Africa, vol. 20, no. 8, Feb. 1920, pp. 131-139, 2 figs. How to eliminate amalgamation in metallurgy of gold and silver ores.

Means Adopted on the New Goch Gold Mine for Reducing the Consumption of Mercury, H. J. Lee. Jl. Chem. Metallurgical & Min. Soc. of South Africa, vol. 20, no. 8, Feb. 1920, pp. 139-141. Amalgamation is carried out with 12 plates in tube-mill house. Loss of mercury is said to be reduced by decreasing number of dressings without any loss in actual recovery.

Amalgamation Plates, Steaming. The Practice of Steaming Amalgamation Plates, S. H. Pearce and J. E. Thomas. South African Min. & Eng. Jl., vol. 29, no. 1478, Jan. 24, 1920, p. 444. Report of Sub-Committee to Chem., Met. & Min. Soc. on advisability or otherwise of steaming amalgamated plates. Committee does not consider, if proper precautions are taken, that steaming should not be continued.

Cyaniding. The Solubility of Zinc in Cyanide Solutions, H. A. White. Jl. Chem. Met. & Min. Soc. of So. Africa, vol. 20, no. 6, Dec. 1919, pp. 97-101, 5 figs. Account of experiments conducted to determine effect of various conditions which in practice might affect consumption of zinc and particularly concentration of cyanide, alkalinity and oxygen present.

The United Eastern Mill, at Oatman, Ariz., Wheeler O. North. Eng. & Min. Jl., vol. 108, no. 15, Oct. 11, 1919, pp. 617-620. Plant for treating gold ores by cyanide process. Absence of filters and use of short ball mills for fine grinding quoted as notable features of plant.

The Use of Haloid Cyanides for the Purpose of Gold Extraction, T. B. Stevens and C. E. Blackett. Bul. Instn. Min. & Metallurgy, no. 185, Feb. 1920, pp. 1-18. Opinion is expressed, based on writers' experimental work, that with certain classes of ore, nature of which is described in article, cyanogen bromide can be used to advantage. Reasons for failure of iodide and chloride are dealt with.

Gold Yield. The Limits of Payable Yield of Fine Gold per Ton of Ore with Premiums & Prices of Gold and Working Costs as Shown, W. A. Caldecott. Supp. to Jl. Chem. Metallurgical & Min. Soc. of South Africa, vol. 20, no. 8, Feb. 1920, chart facing p. 147. Prices of fine gold are calculated by assuming mint par has equivalent to 77/9 per standard oz. (11/12 fine).

Mill Flow Sheet. The Como Consolidated Mill, F. Borzynski. Min. & Sci. Press, vol. 120, no. 2, Jan. 10, 1920, pp. 55-56, 1 fig. Flow-sheet of mill. Ore consists of hard quartz with small amount of calcite, gold and silver.

Milling Plants. Milling Plant of the Alaska-Gastineau Mining Co., E. V. Daveler. Min. & Metallurgy, no. 157, section 11, Jan. 1920, 18 pp., 3 figs. Ore milled is quartz containing gold and silver associated with pyrrhotite, galena, arsenical pyrites, and zinc blende.

New Modderfontein Gold Mining Co. Mill and Treatment Plant at Circular Shaft, E. M. Weston. Eng. & Min. Jl., vol. 109, no. 4, Jan. 24, 1920, pp. 255-259, 4 figs. Plant combines elimination of fines before sorting, gravity flow from stamps, continuous thickening, flexibility of method of slime treatment at low elevation, and collection and treatment of sand.

Ore Treatment. An Unusual Process in the Treatment of Gold Ore, B. L. Gardiner. Jl. Chem. Met. & Min. Soc. of South Africa, vol. 20, no. 7, Jan. 1920, pp. 109-117. Process consists in subjecting ore to action of heat preparatory to treatment by cyanide solutions, temperature to which ore is raised being much lower than that necessary for roasting. It is said that net result of introduction of this system at Connemara Mine in Southern Rhodesia has been to increase extraction from 68 to 86 per cent with little or no increase in working costs.

Ore-Treatment Plant and Treatment Operations—Edna May Gold Mining Company, N. J., Westonia, W. A., M. T. Williams. Proc. Australasian Inst. Min. & Metallurgy, no. 34, June 30, 1919, pp. 19-26, 1 fig. Ore consists mainly of clean quartz of moderately hard and tough nature. Gold content is "free" and fairly coarse, so that large percentage is recovered by amalgamation.

The La Luz and Los Angeles Mine, in Nicaragua, Jesse Scobey. Eng. & Min. Jl., vol. 110, no. 1, July 3, 1920, pp. 6-13, 6 figs. Over 11,000 tons of ore were treated in 1919. Present milling includes stamps, ball mills and classifier, amalgamation and cyanidation having been found the best practice.

Precipitate Smelting. Precipitate Smelting at Tonopah, George J. Young. Eng. & Min. Jl., vol. 108, no. 22, Dec. 13 and 20, 1919, pp. 892-893; 5 figs. Details of furnaces used.

Recovery from Black Sand. Recovery of Gold from Black Sand by Classifier Concentration, John A. Davis and John Gross. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2160, Sept. 1920, 3 pp. Results of metallurgical tests conducted by Alaska station of Federal Bur. of Mines, on recovery of gold from black sands of placer clean-ups.

Thickeners. Thickeners and Decanting Appliances, Henry Hanson. Eng. & Min. Jl., vol. 109, no. 15, Apr. 10, 1920, pp. 853-856, 3 figs. It is estimated that development has been largely along two lines: Intermittent or non-mechanical thickener which has found its greatest application on the Rand, South Africa, and mechanical or continuous-discharge thickener, in use on American continent.

GOLD MINES

Australia. The Hampton Plains Discoveries, West Australia, C. M. Harris and L. R. Benjamin. Min. Mag., vol. 22, no. 5, May 1920, pp. 267-275, 8 figs. Geological features of gold-bearing lodes.

Brazil. The Deepest Mine. Min. & Sci. Press, vol. 121, no. 14, Oct. 2, 1920, pp. 477-478, 1 fig. Morro Velho, a gold mine in Brazil, has reached depth of 6426 ft.

Panel Stoping in. Panel System of Stoping at the Herman Mine, S. H. Brockunier. Eng. & Min. Jl., vol. 108, no. 21, Dec. 6, 1919, pp. 856-858, 2 figs. Stopes worked by system of raises within ore-shoot, followed by panel stoping.

GOLD MINING

Alaska. See Thawing Frozen Gravel.

British Guiana. Gold Mining in British Guiana. Eng. and Min. Jl., vol. 110, no. 13, Sept. 25, 1920, pp. 611-614, 7 figs. Gold production has been decreasing since 1895 and is now only about one-eighth maximum recorded. Few companies are still operating, but mining is hampered by lack of transportation and high costs.

California. Gold Mining in California, George J. Young. Eng. & Min. Jl., vol. 109, no. 7, Feb. 14, 1920, pp. 439-447, 12 figs. It is said that gold-dredging industry is declining, and that drift, placer, and hydraulic mining produce small amount of precious metal and future production is dependent upon deep-lode mining.

Dredges. See DREDGES, Gold-Mining.

Drilling Practice, South Africa. Piston Drills for Use with Hollow Steel, E. M. Weston. Eng. & Min. Jl., vol. 109, no. 8, Feb. 21, 1920, pp. 485-486, 4 figs. Advantage of delivering water to bottom of hole while drilling is indicated and two types in use on Witwatersrand Ferreira Deep are described.

Electricity in. Choice of Electrical Equipment for Gold and Silver Mining, B. B. Beckett. Jl. Electricity, vol. 44, no. 9, May 1, 1920, pp. 440-442. Article based on writer's experience in mines of Goldfield, Nev.

Electricity in Gold and Silver Mining, B. B. Beckett. Jl. Electricity, vol. 44, no. 6, March 15, 1920, pp. 263-265, 4 figs. Records of power consumption of typical property in Nevada.

India. The Romance of Gold Mining in the Mysore State, E. W. T. Slater. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14, 1920, pp. 302-305, 4 figs. Historical review of discovery of gold in Kolar gold field and inception of operations in this area, together with descriptions of industrial conditions.

South Africa. Transvaal Mining in 1919, H. F. Marriot. Eng. & Min. Jl., vol. 109, no. 3,

Jan. 17, 1920, pp. 186-188. Tonnage output is reported to have been less than for previous year, but yield per ton for first nine months is said to have shown increase over that for same period of 1918.

Thawing Frozen Gravel. Thawing Frozen Gravel with Cold Water, Walter S. Weeks. Min. & Sci. Press, vol. 120, no. 11, Mar. 13, 1920, pp. 367-370, 3 figs. Experiments at Nome, Alaska, showed, it is claimed, that surface water could accomplish thawing effectively without addition of artificial heat.

GONIOMETERS

Hand. A New Hand Goniometer (Ein neuer Freihand-Winkelmesser), C. Pulfrich. Zeitschrift für Instrumentenkunde, vol. 39, no. 7, July 1919, pp. 201-212, 17 figs., partly on supp. plate. Theory, constructional details and method of measuring.

Radio. See DIRECTION FINDERS.

GOVERNMENT OWNERSHIP

Railways. See RAILWAYS, Government Ownership.

GOVERNORS

Centrifugal. Making a Small Centrifugal Governor, B. F. Gordon. Model Engr. & Elecn., vol. 41, no. 969, Nov. 20, 1919, pp. 463-466, 11 figs. Governor was designed for ½-hp. Robinson "oblique" type gas engine.

Indirect-Acting. A Simple Theory for the Regulating Action of Indirect Acting Regulators (Einfache Theorie der Reguliervorgänge indirekt wirkender Regulatoren), H. Joos. Schweizerische Bauzeitung, vol. 75, no. 9, Feb. 28, 1920, pp .96-99, 10 figs. Notes on regulation with variable regulating speed and effect of valve friction.

GRAB BUCKETS

Electrically-Driven. The Modern Development of Electrically-Driven Automatic Grab Buckets (Die neuzeitliche Entwicklung des elektrisch betriebenen Selbstgreifers), H. Wintermeyer. Elektrotechnische Zeitschrift, vol. 40, nos. 47 and 48, Nov. 20 and 27, 1919, pp. 600-602 and 610-612, 18 figs. Description and illustrations of automatic grab buckets with electric motor attached to frame, with stationary electric drive, with a single stationary driving motor, and with two stationary driving motors.

GRADE CROSSINGS

Construction and Maintenance. Construction and Maintenance of Grade Crossings on Pacific Electric, Clifford A. Elliott. Elec. Ry. Jl., vol. 55, no. 20, May 15, 1920, pp. 995-998, 5 figs. Where soil will not produce natural crossing on interurban lines graded and oiled and oil macadam crossings are standard. Central plant erected for heating oil and mixing macadam.

Elimination. Railroad Grade Crossing Elimination, Samuel T. Wagner. The J. E. Aldred Lectures on Engineering Practice, 1919-1920, Johns Hopkins University, Dept. of Eng., 1920, pp. 123-139, 9 figs. How railroad grade crossings can be eliminated. Conditions to be met with in a general way and fundamental matters in engineering and legislation involved and two large problems of different methods of treatment.

GRADING

See RAILWAY CONSTRUCTION, Grading.

GRAIN BINS

Reinforced-Concrete. Design of Circular Reinforced Concrete Bins, William Wren Hay. Concrete, vol. 17, no. 3, Sept. 1920, pp. 73-76, 7 figs. Formulæ for determining lateral pressure of walls, and graph for computing proper spacing of reinforcing steel rods.

Loading Test of 18-Ft. Circular Concrete Grain Bin, P. J. Hansen. Eng. News-Rec., vol. 84, no. 7, Feb. 12, 1920, pp. 316-317, 2 figs. Bins separated by tie walls investigated as to behavior under outside pressure from grain in interstices.

GRAIN ELEVATORS

C. & N. W. Ry. Co. Chicago & Northwestern Railway Co. Terminal Grain Elevator, W. H. Finley. Jl. Western Soc. Engrs., vol. 24, no. 5, May 1919, pp. 307-319 and (discussion) pp. 319-322, 6 figs. Located so as to permit grain to be received both by rail and water as well as being shipped out in like manner. Receiving capacity is 1,766,000 bu. per day.

Foundation Settlement. Foundation Troubles of Portland City Grain Elevator. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 176-179, 4 figs. Settlement of large concrete structure is said to have been stopped by driving pinch piles to compress soft ground already piled.

Pennsylvania Railroad. An Improved Grain Elevator for Export Service. Ry. Age, vol. 69, no. 1, July 2, 1920, pp. 9-13, 8 figs. Reinforced-concrete and structural steel structure with storage capacity of 4,257,000 bu. There are four car unloaders and it is said that grain can be unloaded at the rate of 40 cars an hour.

Pneumatic. Pneumatic Elevators, William Cramp. Eng., vol. 110, no. 2853, Sept. 3, 1920, p. 330. Experiments to determine power required to lift granular material by pneumatic means. Empirical formula for vacuum in centimeters of mercury is developed in treatment of different pressures across conveying pipe and quantity of air per second moved under this pressure difference. (Abstract.) Paper read before Eng. Section, British Assn. for Advancement of Science.

Sydney, Australia. Terminal Wheat Elevator, A. Stanley Ridley. Commonwealth Engr., vol. 7, no. 11, June 1, 1920, pp. 327-329, 3 figs. Structure at Sydney, Australia, with total capacity of 6,385,000 bu. Included in plant are drying house, truck shed, shipping gallery system and traveling wharf gantries. Plant is to be electrically driven.

[See also SILOS, Grain.]

GRAIN HANDLING

British Installation. An Interesting Grain Handling Equipment. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 694-696, 3 figs. Installation comprises one telescopic elevator, external to warehouse, two elevators inside warehouse, two automatic weighing machines, one loading-out shoot from warehouse and one loading-out shoot from elevator head.

Floating Pneumatic Machines. A Typical Plant for Sacking Off Bulk Cargo of Grain and Loading It Into Railway Trucks. Eng. & Indus. Management, vol. 3, no. 5, Jan. 29, 1920, pp. 157-158, 2 figs. Installation consists of two floating pneumatic grain handling machines fitted with complete weighing and sacking-off appliances, all mounted on pontoon.

Pneumatic. Power Consumption of Pneumatic Grain Handling Plant, George Frederick Zimmer. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 793-796. Tests indicated at various plants. Translated from Foerdertechnik.

Unloader. New Grain Unloader Saves Time at Elevators. Ry. Age, vol. 69, no. 3, July 16, 1920, pp. 93-94, 3 figs. Device said to open car doors without injury or loss of time.

GRAPHIC REPRESENTATION

Curve Plotting. Graphic Compensation Method (Ueber ein graphisches Ausgleichungsverfahren), Hans G. Schwerdt. Physikalische Zeitschrift, vol. 20, no. 16, Aug. 15, 1919, pp. 362-368, 6 figs. Examples illustrating method given for determining graphically the best curve for a given set of experimental data.

GRAPHITE

Canada. Graphite, Hugh S. Spence. Mines Branch, Can. Dept. of Mines, no. 511, 1920, 202 pp., 99 figs., 56 on supp. plates. Report on graphite industry in Canada, with details relating to the occurrence, distribution, refining, and uses of graphite.

Graphite in Quebec, Canada, H. P. H. Brumell. Eng. & Min. Jl., vol. 109, no. 9, Feb. 28, 1920, pp. 548-550. Mineralogically similar but geologically distinct from Alabama deposits; dry concentration is superseded by flotation, with much improved results; present product compares favorably with Ceylon article.

Concentration of Ores. Concentrating Graphite, Hugh S. Spence. Engr., vol. 130, no. 3376, Sept. 10, 1920, pp. 258-260, 8 figs. Process employed in concentration of graphite bearing ores. Extract from publication written for Canadian Department of Mines.

Cyanamide. The Properties of the Carbon Produced by the Reaction Between Calcium Carbide and Nitrogen (Ueber die bei der Reaktion zwischen Calciumcarbid u. Stickstoff entstehende Kohlenstoffart), A. Remelé and B. Rassow. Zeitschrift für angewandte Chemie, vol. 33, no. 44, June 1, 1920, pp. 139-140, 2 figs. Results of experiments show that calcium cyanamide graphite is a highly dispersed carbide carbon with purely graphitic properties.

Determination in Mineral Deposits. The Problem of Determining Graphite Carbon. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 40, pp. 629-658, 3 figs. Experiments undertaken by Bureau of Mines to determine per cent of graphitic carbon in certain graphite-like mineral deposits and coke.

Preparation for Crucible Use. Mining and Preparing Domestic Graphite for Crucible Use, George D. Dub and Frederick G. Moses. Dept. of Interior, Bur. of Mines, bul. 112, 1920, 80 pp., 28 figs. Examination of deposits in Alabama and other states and survey of preparation and mining methods used. Account of experiments made to determine standard method of sampling and rapid but accurate method of analysis. Experimental work on concentration and refining of domestic crucible graphite to improve quality of product and to lessen waste.

Production in 1919. The Graphite Industry During 1919, Benj. L. Miller. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 226-227. Statistics of production.

Spectra. See SPECTRA, Incandescent Graphite.

GRAPHITIC ACID

Relations of Water to. Graphitic Acid—A Colloidal Oxide of Carbon, Geo. A. Hulett and O. A. Nelson. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 32, pp. 425-439. Relations of water to graphitic acid are investigated and it is found that on removing water from this substance the vapor pressure drops perfectly continuously without suggestion of break. It is thus concluded that relation of water to graphitic acid is exactly that of moisture to colloidal substance which readily absorbs water on large surfaces.

GRAVEL

Mechanical Handling. See HANDLING MATERIALS, Gravel; SAND, Screening and Washing.

Plants. See SAND, Sand-Gravel Plants.

GRAVEL PLANTS

Equipment. Genesee Gravel Co.'s Operations at Earlestead, Mich. Cement, Mill & Quarry, vol. 16, no. 12, June 20, pp. 21-22, 6 figs. Said to be one of largest sand and gravel deposits in United States, comprising 314 acres, estimated to contain 50,000,000 tons with less than 2 per cent stone over 2 in. silt; equipment consists of Sauerman Bros. 1½ yd. dragline; 45 hp. Venn, Severin engine pumps and Thomas hoist; Stephens-Adamson type of screening plant with capacity of 25 cars per day, etc.

New Type of Sand-Gravel Plant. Rock Products, vol. 23, no. 18, Aug. 28, 1920, pp. 34-37, 14 figs. Pumping is done directly into head screen instead of dewatering sump as majority of plants do.

Operating Flooded Pits. Methods of Operating Flooded Gravel Pits. Cement & Eng. News, vol. 32, no. 10, Oct. 1920, pp. 21-23, 2 figs. Difficulties encountered by Clem Gravel Co. of Dallas, Texas, in operating wet gravel pit by steam shovel, with description of how they overcame difficulties by use of dragline excavators.

United Fuel & Supply Co. The United Fuel and Supply Co., of Detroit, Completes Eighth Gravel Plant. Rock Products, vol. 22, no. 25, Dec. 6, 1919, pp. 26-33, 19 figs. Operating features of plant.

[See also SAND, Plants.]

GRAVITATION

Deflection of Light Ray by. The Deflection of a Light Ray by Gravitation (Die Krümmung des Lichtstrahls infolge der Gravitation), Ernst Reichenbächer. Annalen der Physik, vol. 61, no. 1, Jan. 8, 1920, pp. 21-24. Writer seeks to determine curvature of light ray obtained from theory developed in his work entitled Theory of Electricity and Gravitation, published in same journal (no. 52, 1917).

Einstein's Law. Einstein's Law of Gravitation, J. S. Ames. Physical Rev., vol. 15, no. 3, sec. series, Mar. 1920, pp. 206-216. Presidential address before Physical Soc., outlining a few deductions from Einstein's formulæ.

Influence of Medium. On Gravitation (Sur la gravitation), Q. Majorana. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 646-649. Scientific facts and principles giving evidence of influence of medium in propagation or transmission of gravitation of forces.

Majorana's Experiments. Experiments on Gravitation (Expériences sur la gravitation), L. Majorana. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 17, Oct. 27, 1919, pp. 719-721. Undertaken for purpose of determining whether Newtonian attraction is absorbed by masses which it traverses.

Relativity Theory of. Einstein's Relativity Theory of Gravitation, E. Cunningham. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 116-119, 2 figs. Popular exposition. From Nature.

Einstein's Relativity Theory of Gravitation. Nature, vol. 104, nos. 2614, 2615 and 2616, Dec. 4, 11, and 18, 1919, pp. 354-356, 374-376 and 394-395. Points out how Einstein evolved his theory by investigating relation between gravitation and energy and apparent consequent necessity for a beam of light to have weight if it has momentum. Conclusions of theory of relativity in regard to gravitation and solar spectrum.

Note on the Central Differential Equation in the Relativity Theory of Gravitation, A. R. Forsyth. Proc. Roy. Soc., vol. 97, no. A682, Apr. 1, 1920, pp. 145-151. Equation is integrated,

and approximations for solar system are obtained.

The Theory of Relativity, F. M. Denton. Central (City and Guild Eng. College, Lond.), vol. 16, no. 46, Dec. 1919, pp. 71-78. Theory is exposed as follows: That we neither have nor expect to have any experimental evidence of uniqueness of frame of reference called ether but that if there is one, there is an infinite number of such frames of reference, any one of which has relative to any other uniform velocity of translation without rotation, this velocity being of arbitrary magnitude.

The Impossibility of Employing Mechanical Models to Illustrate the Relativity Theory (Die Unmöglichkeit mechanischer Modelle zur Ver anschaulichung der Relativitätstheorie), J. Petzoldt. Berichte der physikalischen Gesellschaft, vol. 21, no. 13-14, July 30, 1919, pp. 495-500. It is pointed out that the history of the theoretic study of electric phenomena in moving bodies has led physicists more and more to conviction that their reduction to mechanical phenomena is not possible, and writer explains reasons for this impossibility. Reply to above article by Max Jacob, pp. 501-503.

Time, Space and Gravitation, Albert Einstein. Science, vol. 51, no. 1305, Jan. 2, 1920, pp. 8-10. Exposition of theory of relativity. From the London Times.

Researches in. On Gravitation. Theoretical and Experimental Researches, Q. Majorana. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 488-504, 4 figs. Examining Newton's law writer concludes that force of gravitation can weaken itself by absorption due to ponderable matter. He visualizes possibilities that matter which shows force of gravitation might heat itself. Method is theoretically determined for estimating density from "factor of gravitational absorption" of a body. In this manner density of sun is computed to be 4.27.

Weyl's Theory. Weyl's Theory of Gravitation and Electricity (Zur Theorie der Gravitation und der Elektrizitäts von Hermann Weyl), Wolfgang Pauli. Physikalische Zeitschrift, vol. 20, no. 20, Oct. 15, 1919, pp. 457-467. It is pointed out, as having important bearing on Weyl theory, that differential equations for static field are symmetric in relation to positive and negative electricity. Field equations of gravitation are presented and problem of electrons is discussed.

[See also RELATIVITY.]

GRAVITY

Fall of Bodies in Liquids. See LIQUIDS, Fall of Bodies in.

GREASE

Lubricating. See LUBRICATING GREASES.

GREAT LAKES

Regulation of Level. Plan to Regulate Great Lakes Level by Niagara Dam, Francis C. Shenehon. Eng. News-Rec., vol. 84, no. 7, Feb. 12, 1920, pp. 308-313, 4 figs. Proposition by Chicago Sanitary District of removable dam in river near Buffalo to permit maintenance of lake level above present stages and still allow depletion for power and storage.

GRINDING

Automobile Parts. Cadillac Grinding Practice, Edward K. Hammond. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 103-107, 9 figs. Description of methods employed in grinding department of plant building high-grade automobiles.

Modern Methods. Grinding Practice in Production, H. Darbyshire. Eng. Production, vol. 1, no. 6, June 1920, pp. 213-216, 5 figs. Early experiences and latter day methods.

Surface. Surface Grinding (Flachenschleifen). Werkstattstechnik, vol. 14, nos. 2 and 3, Jan. 15 and Feb. 1, 1920, pp. 49-53 and 82-86, 52 figs. Notes on operation of surface grinding machines, means of cooling, dry grinding of thin work pieces, fastening warped and non-magnetic work pieces, and grinding large castings. Description of design and operation of a heavy surface-grinding machine with vertical spindle, and examples of work on machines of the planer and vertical-spindle types.

GRINDING MACHINES

Belting Requirements of. Belting Requirements of Well Known Machine Tools—V. Belting & Transmission, vol. 16, no. 12, June 20, 1920, pp. 31-32, 1 fig. Gives specifications of plain, universal and internal grinders; general information as to belting and transmission details; and table giving belting requirements and other transmission features of certain grinders.

British. Jones & Shipman Grinding Machine Developments. Machy. (Lond.), vol. 16, no. 413, Aug. 26, 1920, pp. 650-652, 4 figs. All-gear work head and surface-grinding attachment.

Crankpin. The Landis Crank Grinder. Eng. Production, vol. 1, no. 5, May 1920, pp. 195-196, 3 figs. Production of Landis Tool Co. of Waynesboro, Pa. Crank heads are designed and necessary features added to make machine adaptable for grinding of crankpins.

Cylindrical. Norton Self-Contained Cylindrical Grinding Machine. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 177-179, 6 figs. Machine has minimum operating table speed of 10 ft. per min., and maximum of 36 ft. per min., which is three times speed attempted in past practice.

Design. See MACHINE DESIGN, Working Out Details.

Die Grinding. A Machine for Grinding Button Dies. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 609-610, 3 figs. Machine built by Locomobile Co. of America, Bridgeport, Conn., for salvaging button dies by regrinding cutting edges.

Exhaust Hoods for. Exhaust Hoods for Grinding Machines, E. E. Snow. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 947-948, 3 figs. Writer declares all exhaust hoods are at once a nuisance and a necessity, and describes how hoods were installed in a toolroom in such a manner as to interfere as little as possible with operation of machine.

Internal. Machine Tool Practice as applied to Motor Car Production, J. H. Garnett. Machy. (Lond.), vol. 15, no. 375, Dec. 4, 1919, pp. 285-290, 21 figs. Internal grinding machine and other special types of machine tools used in manufacture of Daimler car.

Locomotive-Links. Link Grinding Machine. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 240-243, 4 figs. Description and illustration of machine constructed by L. Sterne & Co., Ltd., Glasgow, which, though mainly intended for locomotive links, is said to be useful for wider range of work, as radius possible varies between 2 ft. and 10 ft., while machine can also be used for lapping and other work.

Manganese-Steel Grinding. Grinding Manganese Steel, R. M. Johnson. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 659-661, 9 figs. Description of installation of swinging-frame grinding machines.

Norton. Norton 10-inch "B" Type Grinding Machine. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 604f-604g, 4 figs. Table speed has been increased to 36 ft. per minute, which is three times that of fastest speed hitherto attempted.

Plain, New Design of. A New Plain Grinding Machine. Machy. (Lond.), vol. 15, no. 388, Mar. 4, 1920, pp. 732-735, 4 figs. Massive wheel slide is of exceptional length and in no position does wheel spindle center overhang slide bearing. This is said to make for rigidity and sturdy running of wheel when under cut.

Spindles with Eccentric Motion. Grinding Machines with Spindles with Eccentric Motion (Schleifmaschinen mit Planetenspindel), W. Pockrandt. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 36, Sept. 4, 1920, pp. 713-716, 24 figs. Describes two new grinding machines for internal grinding of cylinders, bushings, etc., one of which has vertical and the other horizontal grinding spindles. Points out advantages and disadvantages of these two types.

Standard Classification. The Standardization of Grinding Machine Classification, S. M. Henry. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 736-737. Classification employed by Bureau of Construction and Repair, Navy Department.

Surface Grinders. See GRINDING, Surface.

Types. Two New Grinding Machines. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 858-859, 2 figs. Grinding speed increased 200 per cent on Norton Type B cylindrical grinder.

Universal. A New Universal Grinding Machine. Machy. (Lond.), vol. 15, no. 389, March 11, 1920, pp. 760-761, 4 figs. Grinder has all-gear drive, weighs 6000 lb., and is designed for rapidly grinding external, internal and face work. Wheel-slide suspension weight is contained in body of machine and permits slide to be set round to any angle without interference by weight, tension on slide being maintained irrespective of its angular position.

GRINDING WHEELS

See ABRASIVE WHEELS.

GROUND

Soft, Vibration of. Vibrations of Elastic Soil (Sulle vibrazioni di un suolo elastico), Pietro Alibrandi. Il Nuovo Cimento, vol. 17, nos. 4, 5 and 6, Apr., May, June 1919, pp. 159-181. Technical study. Circumstances of perturbation at points at various distances from source of motion.

GROUPS

Theorems on. Groups Possessing a Small Number of Sets of Conjugate Operators, G. A. Miller. Trans. Am. Math. Soc., vol. 20, no. 3, July 1919, pp. 260-270. Theorems relating to possible number of sets of conjugate operators in group of given order.

GROUTING

Catskill Water-Supply Structures. Grouting Operations, Catskill Water Supply, James F. Sanborn and M. E. Zipser. Proc. Am. Soc. Civil Engrs., vol. 46, no. 1, Jan. 1920, pp. 1-80, 12 figs. Summary of experience and results obtained in use of grout in construction of aqueduct, dams, and other structures of Catskill Works. Mixture consisting of one bag of cement, one bag of sand, and from 6 to 8 gal. of water, was found to be well adapted for backing-up and filling spaces behind tunnel linings. Air pressure used varied from 30 to 90 lb. per sq. in.

GUN MANUFACTURE

Machining Problems. Machining Problems Solved in Gun-Making, J. V. Hunter. Am. Mach., vol. 52, nos. 1, 3 and 14, Jan. 1 and 15, and Apr. 1, 1920, pp. 39-43, 133-136, and 733-735, 47 figs. Jan. 1: Special gaging devices used in manufacture of 4.7 in. gun. Jan. 15: Special tools devised at Northwestern Ordnance Co.'s plant. Apr. 1: Tools and fixtures applied to finishing breech mechanism of 4.7-in. gun.

One-Piece Construction. An Experiment in One-Piece Gun Construction, P. W. Bridgman. Min. & Metallurgy, no. 158, section 14, Feb. 1920, 16 pp., 10 figs. Experiment was undertaken by U. S. Navy. Procedure was to start with single forging of approximately the dimensions of the finished gun, subject it to internal hydrostatic pressure of about 100,000 lb. per sq. in., and thus raise elastic limit by producing compression in inside layers of the barrel and tension in outside layers, and then to machine gun to final dimensions.

GUN MOUNTS

Aeroplanes. The Airplane Flexible Gun Mount and Accessories. Eng. Division Air Service, March 1920, 39 pp., 24 figs. Operation and installation of gun mount.

Naval. 12-In. Gun. Mountings on H.M.S. "Agincourt." Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 703-705, 10 figs., partly on supp. plate. Main feature of mounting is that one lever works all machinery in gun-house and thus replaces four levers.

Railway. A Study of the Railway Mount, G. M. Barnes. Jl. U. S. Artillery, vol. 53, no. 2, Aug. 1920, pp. 120-142, 13 figs. From study of railway carriages already built rules are formulated prescribing characteristics of railway mounts for use of Coast Artillery Corps. It is said, for example, that cannon should be mounted so as to give at least 55 deg. elevation for a gun and 65 deg. for a howitzer, and that mount should be of platform type.

Recoil Mechanism. Unusual Methods of Securing Extreme Accuracy, A. L. De Leeuw. Am. Mach., vol. 52, nos. 20 and 21, May 13 and 20, 1920, pp. 1049-1053, 17 figs. and 1094-1097, 8 figs. Work involved in machining recoil mechanism for gun carriages.

GUNITE

See CEMENT GUN, Relining Park Lake; HOUSES, CONCRETE, Gunite Construction for; WALLS, Gunite Construction for.

GUNNERY

Naval. Naval Gunnery, Lord Congleton. Jl. Eng. Inst. of Canada, vol. 3, no. 8, Aug. 1920, pp. 379-383, 8 figs. Description of gun-director system.

GUNS

Bore, After-Corrosion of. The Cause and Prevention of After-Corrosion on the Bores of Firearms, Wilbert J. Huff. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 862-870, 5 figs. Results of laboratory study, comprising exposure of fired rifles and fouled barrel sections to known humidities, chemical examination of corrosive residue, use of special ammunition, and analysis and testing of many "nitrosolvents" and other compositions recommended as preventatives. Study was conducted at Explosives Chemical Laboratory, Pittsburgh Experiment Station, Bureau of Mines.

Boring. See LATHES, Gun-Boring.

British Quick-Firing 18-Pounder. The British 18-Pounder Quick-Firing Gun, I. William Chubb. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 617-621, 12 figs. Methods of manufacture employed in one of several national factories specially organized by Great Britain.

18-Pounder, Quick-Firing. The British 18-Pounder Quick-Firing Gun. Am. Mach., vol. 51, no. 16, Oct. 16, 1919, pp. 733-735, 6 figs. Operations of fitting to cartridge gage and rifling gun.

Erosion of. On Erosion of Guns, Masatosi Okôchi. Jl. College of Eng., Tokyo Imperial University,

vol. 9, no. 7, March 31, 1919, pp. 239-265, 6 figs. partly on suppl. plate. Survey of experiments published by various investigators and theoretical analysis of their results. Causes of gun erosion are believed to be (1) chemical action of combustion gas—not considered serious, (2) partial melting of gun barrel owing to leakage of high temperature gas through narrow path between driving band and surface of bore, (3) cracks on surface of bore—believed to play the most important rôle in erosion, and (4) wear of material on surface of bore owing to enormous friction produced by motion of projectile.

See also STEEL, Nitrogen in.

4.7-in. Rifle. Machining Problems Solved in Gun Making, J. V. Hunter. Am. Mach., vol. 52, no. 12, March 18, 1920, pp. 613-616, 15 figs. Breech mechanism parts of 4.7-in. rifle, model 1906.

Howitzers. See HOWITZERS.

Machining Problems. Machining Problems Solved in Gun Making. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 949-952, 17 figs. Account of Northwestern Ordnance Co. plant at Madison, Wis., and gun which was built there.

Manufacture. See GUN MANUFACTURE.

Naval. Accuracy of Fire at Long Ranges, J. V. Chase. U. S. Naval Inst. Proc., vol. 46, no. 8, Aug. 1920, pp. 1175-1195. Analytical study of means for increasing accuracy of naval guns at long ranges.

Rifling. Rotating Bands, O. Veblen and P. L. Alger. Jl. U. S. Artillery, vol. 51, no. 4, Oct. 1919, pp. 355-390, 20 figs. It is recommended that rifling of gun be made with uniform twist, applying approximately ten grooves per inch of caliber, width of grooves being somewhat greater than that of bands.

Schneider 155-Mm. The Schneider 155-MM. Gun. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 512-513, 7 figs. Principal data: Total length of gun, 16 ft. 3 in.; length of gun in firing position, 26 ft. 11 in.; weight of gun complete, 8307 lb.; weight of gun in firing position, 19,320 lb.; wheel tracks, carriage, 6 ft. 1⅝ in.; wheel track, gun carrier, 6 ft. 5 11/16 in.

Shooting Capacity of. Influence of Weight and Shape of Shell on the Shooting Capacity of Guns (Einfluss des Geschossgewichtes und der Geschossform auf die Schiessleistungen der Geschütze), H. Justrow. Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 15, nos. 6 and 8, Mar. 11 and Apr. 11, 1920, pp. 73-76 and 103-104, 4 figs. Comparison of maximum range and operations of different guns. Tables and curves are given showing influence of weight of shell. It is demonstrated that by the usual purely empirical method it is never possible to determine the actually most favorable conditions; and in problems of ballistics, construction of projectile, etc., calculation must go hand in hand with experience.

[See also FORTIFICATIONS, German, in Belgium; GUN MOUNTS; STEEL, HEAT TREATMENT OF, Rifles and Guns.]

GYMNASIUMS

Lighting. See LIGHTING, Armories and Gymnasiums.

GYPSUM

Building Construction. See BUILDING CONSTRUCTION, Gypsum in.

Screening and Mixing. Process Technology of Gypsum, Curtis F. Columbia. Cement, Mill and Quarry, vol. 16, no. 1, Jan. 5, 1920, pp. 25-27, 2 figs. Screening and mixing.

Specifications. Report of Committee C-11 on Gypsum. Twenty-Third Annual Meeting Am. Soc. for Testing Matls., June 22-25, 1920, 30 pp., 1 fig. Proposed revised tentative specifications for gypsum and calcium gypsum, and proposed revised tentative methods for tests of gypsum and ground gypsum production.

GYPSUM BOARD

Fire-Resisting Properties. Gypsum Board Survives Severe Fire Test. Contract Rec., vol. 34, no. 24, June 16, 1920, pp. 578-579, 3 figs. Its fire-resisting properties are said to have been successfully demonstrated, and excessive heat produced no distortion.

GYRO COMPASSES

See COMPASSES, Gyroscopic.

GYROSCOPE

Applications of. Technical Applications of the Gyroscope (Technische Anwendungen der Kreiselbewegung), H. Lorenz. Zeitschrift des Vereines deutscher Ingenieure, vols. 63 and 64, nos. 49, 50 and 3, Dec. 6 and 27, 1919, and Jan. 17, 1920, pp. 1224-1231, 1250-1257 and 68-69, 40 figs. Equations of motion of the gyroscope are presented in simple form, from which oscillation formulæ for small deflections of gyroscope axis from a middle point are derived. Discusses so-called direction gyroscopes or devices for maintaining direction of torpedoes, as well as gyro-compasses, stabilizers for aeroplanes, monorail car and ship-stabilizing devices.

GYROSTABILIZER

See SHIPS, Stabilized Liners.

H

HACK SAWS

Blade Testing. Testing Hacksaw Blades, Howard H. George. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 155-157, 6 figs. Suggests method of testing.

Testing Hack Saw Blades for Electric Railway Use. Elec. Ry. Jl., vol. 55, no. 6, Feb. 7, 1920, pp. 297-299, 4 figs. Gives results for six different makes of blades tested to point of failure in automatic machine so that personal element was removed.

Manufacture. The Manufacture of Hack Saw Blades. Machy. (Lond.), vol. 16, no. 414, Sept. 2, 1920, pp. 672-674, 5 figs. Methods used by Sheffield & Hallamshire Hack Saw Co., Ltd.

HALOGENS

Copper-Flame Test. The Copper Flame Test for Halogens in Air, Arthur B. Lamb, P. W. Carleton, W. S. Hughes and L. W. Nichols. Jl. Am. Chem. Soc., vol 42, no. 1, Jan. 1920, pp. 78-84, 3 figs. Method is outlined for rendering copper flame test much more sensitive so that "as little as one part of halogen in 50 or 100 million parts of air is readily detected."

Electrolytic Determination. The Electrolytic Determination of the Halogens: An Indirect Method, J. H. Reedy. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1898-1902, 2 figs. Suggests that technique of useful methods may be simplified and process made more or less automatic by carrying out analysis under constant potential of 0.59 volt and determining halogen by loss of weight upon electrolytic reduction of halide deposit to metallic silver.

HAND LEVERS

Design of. The Design of Forged Hand Levers, John S. Watts. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 855, 1 fig. Also in Machy. (Lond.), vol. 16, no. 403, June 17, 1920, p. 333, 1 fig. Includes chart giving dimensions of hand-levers, in which a pull of 150 lb. on handle is provided for.

HANDLING MATERIALS

American Ports, Equipments of. Installation of Mechanical Appliances and Railway Terminals at Large Maritime Ports (Amenagement de l'outillage et des voies a l'arriere de quelques postes maritimes intensifs), M. Sabouret. Annales des Ponts et Chaussées, vol. 52, no. 5, Sept.-Oct. 1919, pp. 125-170, 12 figs. Economical value of intensifying handling of materials by up-to-date equipment is emphasized and reference is made to organizations for handling materials in existence at various American ports.

Car Unloading. See CARS, Unloading.

Cargo, Mechanical. See TERMINALS, MARINE, Cargo Handling.

Chemicals. Mechanical Handling of Chemical Materials, George Frederick Zimmer. Chem. Age, vol. 1, nos. 14 and 15, Sept. 20 and 27, 1919, pp. 378-380, 406-407, 8 figs. Handling of viscous and deliquescent materials.

See also POTASH, Mechanical Handling.

Coal. See COAL HANDLING.

Cost of. Cost of Handling Material, C. S. Bundesman. Indus. Management, vol. 60, no. 1, July 1920, pp. 11-12, 5 figs. Writer claims that in many plants material control is neglected, and its costs practically unknown and urges analyzing each step in handling materials and determining cost of each operation. Records obtained in factories from these analyses are shown.

English Docks, System on. Cargo Handling in England, F. T. Chambers. Nautical Gas., vol. 98, no. 10, Mar. 6, 1920, pp. 381-382. Writer, who was sent abroad in 1918 at head of mission to study various features of port management and development, believes American engineers could profitably study system followed in construction of modern British docks.

Foundries. See FOUNDRIES, Mechanical Handling in.

Freight. See FREIGHT HANDLING.

Gravel. Mechanical Handling of Gravel or Broken Stone, Alan Mair Jackson. Can. Engr., vol. 38, no. 11, Mar. 11, 1920, pp. 273-275, 1 fig. Installation at Brant County, Ontario, combining slot, elevator and bin method. Paper read before County Road Superintendents & Engrs. of Ontario.

Mechanical Loaders Handle Gravel at Low Cost, P. Philip. Contract Rec., vol. 34, no. 17, Apr. 28, 1920, pp. 385-386, 4 figs. Experience in British Columbia. Figures are given showing comparative costs of loading trucks by hand and by mechanical loader.

Machine Shops. Handling Material at the Plant of the Greenfield Tap and Die Corporation, Peter F. O'Shea. Am. Mach., vol. 52, no. 17, April 22, 1920, pp. 880-884, 5 figs. Plant turns out small gages, taps and dies. Material travels in machine shop from left to right, coming in at windows at left as raw material and falling into aisle at right in form of blanks. Blanks are separated into lots and assigned to corresponding departments.

Mass Production and. The Handling and Testing of Materials, E. A. Allcut. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 643-644. Suggestions in regard to organizing, handling and testing of materials used for mass production.

Mechanical Equipment for. Handling Materials Mechanically (La manutention mechanique des matières), M. Hegelbacher. Vie Technique & Industrielle, vol. 1, no. 12, Sept. 1920, pp. 495-498, 12 figs. Types of industrial conveyors.

Picking out Bars. The Storage and Handling of Materials, E. A. Allcut. Metal Industry (Lond.), vol. 16, no. 1, Jan. 2, 1920, pp. 1-2, 1 fig. Tests adopted for picking out bars.

Pneumatic System for Calcium Sulphide. Pneumatic Handling Installation for Calcium Sulphide, G. F. Zimmer. Chem. Age, vol. 2, no. 43, April 10, 1920, pp. 372-373, 4 figs. Installation at Works of Deutsche Claus-Schwefel-Gesellschaft, Bernburg, Germany.

Shingle. Beach Shingle on the Open Coast (Om Udskibning af Strandsingels fra aaben Kyst), A. Frahm. Ingeniören, vol. 29, no. 80, Oct. 6, 1920, pp. 613-615, 7 figs. Installation comprises shingle excavator, silos for storage, and conveying ropeway for discharging shingle into silos.

Systems of. Systems of Handling Materials, Gordon C. Keith. Can. Manufacturer, vol. 40, no. 9, Sept. 1920, pp. 47-49, 3 figs. Series of articles dealing with cost of handling materials in factory and descriptions of systems designed to reduce handling costs and reduce time of conveying, transporting, loading and unloading material.

Trucks for. See INDUSTRIAL TRUCKS, Types.

[See also LIFTING MAGNETS; TERMINALS, MARINE, Mechanical Handling at.]

HANGARS

Concrete. French Airship Sheds Built of Framed Concrete. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, pp. 702-703, 2 figs. Both arch truss and three-hinged arch ribs are used as roof which is supported on light framed side ports. Translated from Génie Civil.

Navy Dirigible Hangar at Lakehurst a Huge Structure. Eng. News-Rec., vol. 84, no. 19, May 6, 1920, pp. 892-897, 6 figs. Approximately 6.4 acres covered by roof arches abutting on high triangular towers. Plan is 803 x 360 ft. and arch crown 172 ft. above ground. End doors are self-supporting structures.

Modern Designs. Modern Designs of Hangars for Dirigibles (Neuere Systeme von Luftschiffhallen), W. L. Audrée. Eisenbau, vol. 11, no. 1, Jan. 13, 1920, pp. 18-38, 50 figs. It is indicated that in order to provide protection of ship against storms as well as safe entrance and exit, the longitudinal axis of hangar should correspond, if possible, to general direction of wind. Details of various designs of stationary and portable hangars. Article was written in 1915, but was not released for publication until after the war.

Richard Type. Housing the Airplane, E. L. R. Grimsley. Aviation, vol. 7, no. 6, Oct. 15, 1919, pp. 271-272, 3 figs. Richard's patent hangar designed according to following requirements: minimum span of 72 ft., weight not to exceed 11,500 lb., ease in erection and ease of transport.

Wooden. A Large Wooden Hangar for Hydroplanes (Eine hölzerne Riesenhalle für Flugzeuge). Holzwelt, vol. 7, no. 12, Feb. 10, 1920, p. 6, 2 figs. Description of a large hangar in Warnemünde completed in Dec. 1919, built entirely of wood, an interesting feature of which is the door which opens in a few minutes to width of 55 m. and height of 18 m. Dimensions: Width, 55 m.; length, 160 m.; height, 31 m.

HARBOR IMPROVEMENTS

Amsterdam. Harbor Works at Ijmuiden Near Amsterdam (Eenige hoofdpunten van het ontwerp der nieuwe sluis- en havenwerken te Ijmuiden),

C. E. W. van Panhuys. Ingenieur, vol. 35, no. 39, Sept. 25, 1920, pp. 705-715 and (discussion) pp. 715-718, 14 figs. Details and illustrations of canal lock, of course of new channel and of extension of harbor quays.

Board of Engineers for Rivers and Harbors. Governmental Investigation of River and Harbor Improvements, A. H. Ritter. Military Engr., vol. 12, no. 63, May-June 1920, pp. 261-264 and 314, 316, and (discussion) 316, 318. Facts concerning work of Board of Engineers for Rivers and Harbors, correcting erroneous accounts which have appeared previously.

Hamilton, Ont. Proposed Development of Hamilton Harbor, John M. Wilson. Can. Engr., vol. 37, no. 25, Dec. 18, 1919, pp. 537-540 and 545-548, 3 figs. Report presented to Hamilton Harbor Commission, recommending creation of 1250 acres of park and residential property, 1198 acres of industrial land, 6.26 miles of docks and 16.98 miles of boulevard.

Kingston, Ont. Proposed Development of Kingston Harbor, A. Langlois. Can. Engr., vol. 39, no. 15, Oct. 7, 1920, p. 408, 1 fig. Movement contemplates making Kingston the Lake Ontario terminal, for proper utilization of Welland Ship Canal.

Malay States. New Works for the Federated Malay States Government Railways. Engr., vol. 129, no. 3357, April 30, 1920, pp. 440-442, 11 figs. Works consist of reinforced-concrete jetty 1100 ft. long, coal wharf 900 ft. long, widening and reconstruction of existing wharf 600 ft. long, basin for vessels with 16 ft. depth at low water, dredging of channel and approaches to depth of 30 ft. below low water, and reclamation of swamps and foreshore.

Sedimentation, Prevention of. Chicago to Create a Harbor of Lake Calumet, George E. Edwards. Eng. World, vol. 17, no. 2, Aug. 1920, pp. 98-100, 1 fig. Calumet River will be turned to flow in westerly direction in order to rid Lake Calumet harbor of sedimentation. Harbor will cost approximately $4,000,000.

Whitby, England. Whitby Harbour Extension Works, James Mitchell. Concrete and Constructional Eng., vol. 15, no. 8, Aug. 1920, pp. 517-529, 13 figs. Particulars of two new piers, each 500 ft. long, a new fish-quay, 700 ft. long, and an improved entrance channel and general deepening of harbor up to swing bridge, depth of water provided throughout being 7 ft. at low water of ordinary spring tides.

HARBORS

Fortification of. See National Defense.

New Orleans. See CANALS, New Orleans Harbor.

Pacific Coast. The Size of Ships and Pacific Harbors, C. E. Grunsky. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 413-414. It is suggested that tendency toward increasing size of ships, which is one of factors limiting commerce to two or three ports of world, be discontinued, and that ships be kept within a limit of size which will enable them to make use of normal harbors.

[See also BREAKWATERS; WAVES, Force of.]

HARDNESS

Brinell Test. See Testing.

Measurement of. Scleroscopic, Ball-Pressure and Scratch Hardness (Skleroskop-Kugeldruck- und Ritzhärte), G. Berndt. Werkstattstechnik, vol. 14, no. 7, Apr. 1, 1920, pp. 201-205, 1 fig. In pieces of the same steel but subjected to different thermal treatment the scleroscopic and Brinell hardness follow parallel courses and their numerical relation can also be regarded as sufficiently constant; scratch hardness is not strictly parallel to the other two and its numerical connection with the Brinell and scleroscopic hardness is subjected to marked fluctuations.

Scratch Test. See Testing.

Soft Metals. Testing the Hardness of Soft Metals, Especially of Bearing Metals (Ueber die Härteprüfung weicher Metalle, insbesondere der Lagermetalle), W. Deutsch. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 1, Aug. 1919, pp. 7-23, 14 figs. Results of systematic tests are said to show that the customary rules for hardness are not always applicable to soft metals. A method is therefore given for standardizing the hardness determination of soft metals. A conception of maximum stationary hardness is developed and designated as test hardness, which, in the case of the tested metal, lies at 500 kg. pressure and is practically reached in three minutes.

Testing. Note on "The Ball Test," Thomas Baker and Thomas F. Russell. Eng., vol. 109, no. 2838, May 21, 1920, pp. 698-700, 9 figs. Paper read before Iron & Steel Inst.

Study of the Manner of Testing the Hardness of Bodies and Particularly of Metals by Means of the Sclerometer (Étude sur les essais de dureté des corps et des métaux en particulier au moyen du scleromètre), J. Servais. Bulletin du Laboratoire d'Essais mécaniques, physiques, chimiques et de machines du Conservatoire National des Arts et Métiers, no. 18, 1919, 49 pp., 39 figs. Microphotographs showing how metal is displaced by action of diamond. Graphs indicating variation of depth of scratch in terms of total effort applied on diamond point.

The Brinell and Scratch Test of Hardness, W. C. Unwin. Engineering, vol. 108, no. 2812, Nov. 21, 1919, p. 669. Comparison of empirical formulæ expressing index of hardness as determined by Brinell and scratch tests.

See also METALS, Hardness Measurement; STEEL, Hardness Testing.

Testing, Machines for. See CAR WHEELS, Tires, Maintenance of; TESTING MACHINES, Brinell Hardness Testing; Hardness.

HARMONIC MEAN

Geometric Demonstration. A Simple Geometric Demonstration of the Harmonic Mean (Einfache geometrische Darstellung des harmonischen Mittels), E. Orlich. Archiv für Elektrotechnik, vol. 8, no. 5, Sept. 15, 1919, pp. 183-187, 8 figs. Its usefulness in connection with alternating-current problems.

HAULAGE

Mine. See MINE HAULAGE.

HEALTH

British National Insurance Act. The British National Health Insurance System, Henry J. Harris. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 45-59. By act of Dec. 16, 1911, which came into operation on July 15, 1912, system of compulsory health and invalidity insurance was introduced into Great Britain. Article summarizes provisions of this act as amended by legislation of 1913, 1918 and 1919.

Chemical Industry, Hazards in. Health Hazards in the Chemical Industry. Chem. Age, vol. 1, no. 7, Dec. 25, 1919, pp. 308-310. Based on survey of conditions affecting labor employed in chemical industries of State of New York, made by Industrial Commission of State Dept. of Labor.

Health Hazards of the Chemical Industry. State of N. Y., Dept. Labor, Special Bulletin, no. 96, Nov. 1919, 69 pp., 11 figs. Based on examination of 335 plants.

Cotton Industry, Improvement in. Preventable

Death in Cotton Manufacturing Industry, Arthur Reed Perry. U. S. Dept. Labor, Bur. Labor Statistics, no. 251, 1919, 534 pp. Extensive tables are presented showing death hazard by age groups for wage earners under 45 years. Discussion is given of factors which have been specially active in cutting off lives of wage earners during age periods which are normally of greatest protective activity.

Dust Hazards. See DUST, Health Hazards.

Humidity and. See HEATING AND VENTILATION, Health and Humidity.

Industrial Hazards. Industrial Health Hazards, Charles A. Lauffer. Safety Eng., vol. 38, no. 5, Nov. 1919, pp. 279-282. Classification of hazards of employees and suggested remedies. From Proc. of Eighth Annual Safety Congress.

Medical Care of Workers. The Medical Care of Industrial Workers, C. D. Selby. Eng. & Indus. Management, vol. 2, no. 24, Dec. 11, 1919, pp. 742-745, 2 figs. Concerning relation of medical departments and industrial organizations, and selection of industrial personnel.

Mental Hygiene. The Mental Hygiene of Industry, E. E. Southard. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 100-106. Preliminary report of study being undertaken under auspices of Engineering Foundation. Term mental hygiene is used to cover expert activities of medical men who deal with problems of mental diseases, of those who are endeavoring to improve methods of mental testing and of those who are dealing with personnel matters and have had experience in character-handicap cases.

Miners. See MINING INDUSTRY, Health of Workers.

Miners' Nystagmus. A Lecture on Miners' Nystagmus, T. Lister Llewellyn. Trans. Instn. Min. Engrs., vol. 58, part 3, Feb. 1920, pp. 167-175 and (discussion) pp. 175-182. Theory that disease is due to deficient illumination is upheld, symptoms are explained and factors determining occurrence of disease are discussed.

Miners' Nystagmus, T. Lister Llewellyn. Colliery Guardian, vol. 119, no. 3081, Jan. 16, 1920, pp. 170-171. Attributes production of this disease principally to insufficient illumination. Paper read before North Staffordshire Inst. Min. Engrs.

Public Health Officers. New Specifications for Public Health Officers, Morris Knowles and Maurice R. Scharff. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 39-42. It is required that such officers be qualified, trained and experienced in sanitation, public health and public health administration. It is believed if this new specification were incorporated in national, state and municipal laws, cause of public health would be advanced. Paper read before Sanitary Eng. Section of Am. Public Health Assn. Convention.

Sickness Reporting. A Standard Method of Sickness Reporting. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 220-223. Formulated by Special Committee on Industrial Morbidity Statistics, Vital Statistics Section of Am. Public Health Assn., in coöperation with Public Health Service and with advice and assistance of other Government bureaus.

Typhoid Rate Reduction. Reducing Typhoid Fever Rates. Mun. Jl. & Public Works, vol. 48, no. 3, Jan. 31, 1920, pp. 46-48. Table is given showing yearly rates for registration states and large cities during 1906 to 1917.

[See also WELFARE WORK, Medical Attention.]

HEAT

Conduction of. Bromwich's Method of Solving Problems in the Conduction of Heat, H. S. Carslaw. Lond., Edinburgh & Dublin Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 603-611, 3 figs. In a paper edited in Philosophical Magazine, 220, April 1919, Bromwich advocated use of so-called operational methods in electrical and other physical problems. Modifications in application of such suggestion are proposed.

Dissipation by Various Surfaces. The Dissipation of Heat by Various Surfaces, T. S. Taylor. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 230-232 and 259, 4 figs. Using bare tin as standard of reference, it was found in experiments that tin covered with 0.013 in. of sheet asbestos dissipated about 37 per cent more heat; asbestos-covered tin having layer of dust, 32 per cent more; and tin with layer of dust only, 7 per cent more. Thickness of 0.4 in. of asbestos resulted in saving of 25 per cent over that of bare pipe, and seven layers of 0.013-in. sheet asbestos loosely applied, 75 per cent.

Electrically Generated. The Economical Utilization of Electrically Generated Heat (Ueber die sparsame Ausnutzung elektrisch erzeugter Wärme), H. Schneider. Elektrotechnischer Anzeiger, vol. 37, no. 42, Mar. 13, 1920, pp. 197-198, 2 figs. It is pointed out that through suitable insulation, proper arrangement and selection of heater material, and through skilful arrangement of manufacturing processes, the economical electric heating and, in many instances, a continuous utilization of the heat generated can be effected.

Expansion. See EXPANSION.

Latent. See LATENT HEAT.

Losses. See HEAT LOSSES.

Measurement. Recent Changes of Ideas Concerning Heat Engineering—I, Middleton Smith and A. G. Warren. Engr., vol. 129, no. 3362, June 4, 1920, pp. 569-570. Notes on steam and other vapors; symbols and nomenclature for the total heat or holotherm of a substance, etc.

Oxidized Alcohol as Source. On the Nature of the Heat Production in a System of Platinum Black, Alcohol, and Air, L. B. Loeb. Proc. Nat. Acad. of Sciences, vol. 6, no. 3, March 1920, pp. 107-110. It is concluded from experiments that heat is liberated principally in process of oxidation of alcohol on surface of platinum and only to a small extent by adsorption of air or alcohol vapor by platinum black.

Radiation. See RADIATION.

Radiation in Gaseous Explosions. An Analysis of the Radiation Emitted in Gaseous Explosions, W. T. David. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 84-95, 1 fig. Experimental results are said to have established that in explosions of coal gas and air and of hydrogen and air, ratio of energy in 2.8μ radiation emitted to that in radiation of longer wave length decreases as temperature decreases.

Solar, Origin of. On the Origin of Solar and Stellar Heat (Sur l'origine de la chaleur solaire et stellaire), Emile Belot. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1563-1565. Suggests theory based on assumption that heat evolved from cosmic collisions is stored in sun and is being gradually radiated away.

Specific. See SPECIFIC HEAT.

Storage. See BOILERS, Electrically Heated.

Transmission. See HEAT TRANSMISSION.

[See also THERMODYNAMICS.]

HEAT INTERCHANGERS

Double-Pipe. Double Pipe Heat Interchangers, George A. Richter. Chem. & Met. Eng., vol. 22, no. 12, March 24, 1920, pp. 551-556, 13 figs. It is concluded from experimental work

that double pipe heat interchanger in form of helix gives marked increase in K over same tubular parts put into form of straight pipe lengths, also that conductivity in all cases increases slightly with increase in average temperatures in system. Helical cooler consisting of 2-in. pipe within 4-in. pipe was found to give higher conductivity than corresponding cooler equipped with 1-1.2-in. inner coil. Paper read before Am. Inst. Chem. Engrs.

HEAT LOSSES

Buildings. Fundamental Principles of the Calculation of Heat Losses for Buildings (Grundlagen der Wärmeverlustberechnung für Gebäude), B. Biegeleisen. Gesundheits-Ingenieur, vol. 43, no. 31, July 31, 1920, pp. 361-372, 4 figs. Writer points out that, until other and more accurate tests are available, the most expedient way of improving method of calculation is (1) through determination of faults in existing methods, and (2) through utilization of results of tests carried out since the development of Rietschel's calculations.

Steam Pipes. Heat Insulation Facts, L. B. McMillan. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 387-402, 7 figs. Curves showing rates of heat losses from uninsulated surfaces, chart indicating heat lost by bare steam pipe and saving which may be secured by using good covering, graph of variation of heat transmission for various thicknesses of material on flat surfaces, etc.

Underground Steam Mains. Theory of Heat Losses from Pipes Buried in the Ground, John R. Allen. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, nos. 4 and 6, May and Sept. 1920, pp. 455-469 and 588-596, 15 figs. May: Concluded from experiments in Research Bureau at U. S. Bur. of Mines Laboratories (1) That heat loss from pipe is not proportional to external surface of pipe, (2) heat loss per linear foot of pipe becomes smaller as pipe diameter increases, (3) heat loss from pipe is not proportional to thickness of covering and there is very little advantage to be gained in increasing thickness of insulation to more than two inches, (4) depth to which covered pipe is buried makes little difference in heat loss, provided center of pipe is 2 ft. or more below ground surface, (5) heat loss from pipe is not proportional to conductivity of covering, and (6) poor covering in dry ground will give better results than good covering in wet ground. Sept.: Following conclusions derived from analysis: (1) As diameter of pipe increases the desirable thickness of covering used should be increased with small ropes, 1 in. thickness will ordinarily be economical, but with larger pipe it may be economical to increase thickness to 2 in. and over; (2) in multiple covering, the better covering should be placed next to pipe and the poorer covering outside in order to ensure minimum heat transmission.

See also Steam Pipes.

HEAT METERS

Compensated. A New Compensated Heat Meter, Charles P. Frey. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 27-33 and 51, 6 figs. Also in Sci. Am. Supp., vol. 88, no. 2292, Dec. 27, 1919, pp. 379-383, 6 figs. Apparatus is essentially Brown pyrometer in which effect of line and thermocouple resistance have been eliminated.

Principles. Heat Meters (Einiges über Wärmezähler), H. Hilliger. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, no. 27, July 2, 1920, pp. 201-202, 7 figs. Discussion of the fundamental principles governing construction of heat meters and the existing recommendations and patents therefor in connection with steam heating and hot-water supply.

HEAT PUMPS

Purpose of. The Heat Pump (Die Wärmepumpe), M. Hottinger. Schweizerische Bauzeitung, vol. 76, no. 10, Sept. 4, 1920, pp. 107-109, 7 figs. Describes device by use of which heat quantities which cannot be used because of their low temperature are brought to a higher and useful temperature, and gives costs of recovery of heat by this means.

Uses. The Heat Pump (Die Wärmepumpe), H. Dahme. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 21 and 22, May 21 and 28, 1920, pp. 153-154 and 162-165, 10 figs. Details of various new types of compression vaporizers, equipped with heat pumps by means of which the compressed vapors are forced to give up their latent heat.

[See also EVAPORATORS.]

HEAT REGULATORS

Electric. Electric Heat Regulators (Elektrische Wärmeregler). Elektrotechnischer Anzeiger, vol. 36, nos. 28 and 30, Apr. 3 and 8, 1919, pp. 135-136 and 145-146, 9 figs. Details of Steinle, Hartung, Quedlinburg and other types.

HEAT STORAGE

See BOILERS, Electrically Heated.

HEAT TRANSMISSION

Bibliography. Bibliography on Heat Transmission. A.S.R.E. Jl., vol. 6, no. 5, Mar. 1920, pp. 379-403. References to articles and publications treating of **heat insulation and heat** transfer, compiled by Charles H. Herter.

Boiler Flues. Heat Transfer in Flues, Lawford H. Fry. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 265-268, 5 figs. Formulæ are derived and their experimental and mathematical bases explained.

The Transmission of Heat in Boiler Flues, J. Nicholson. Mech. World, vol. 66, no. 1717, Nov. 28, 1919, pp. 256-257, 1 fig. Compilation of formulæ given by various authorities.

Building Walls. Heating and Ventilating Research Work. Domestic Eng. (Lond.), vol. 40, no. 22, Oct. 1920, pp. 149-150. Heat transmission through thin walls. From report of Building Matls. Research Committee under British Department of Scientific and Industrial Research.

Concrete Walls. See WALLS, Concrete, Heat Transmission through.

Mash Cookers and Brew Kettles. Transmission of Heat in Mash Cookers and Brew Kettles (Ueber den Wärmedurchgang an Heizkörpern von Dampfphannen), Karl Fehrmann. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 40, Oct. 4, 1919, pp. 973-978, 6 figs. Deals with heat transmission in kettles and cookers employed in breweries for boiling mash and wort. Experiments are said to demonstrate the dependence of coefficient of heat transfer on pressure of superheated steam.

Rate of Transfer. Heat Transfer, John E. Starr. Refrigerating World, vol. 55, no. 9, Sept. 1920, pp. 11-13. Confusion now existing in calculating rate of heat transfer would, it is claimed, be avoided if all engineers figured the "mean difference" on a scientific basis, and author suggests a method.

HEAT TREATING

Electric Furnace in. 22 Ways Electric Heat Can Cut Your Costs, A. L. Allsop. Factory, vol. 25, no. 5, Sept. 1, 1920, pp. 691-694, 10 figs. Advantages of using electric furnace.

Malleable Iron. See MALLEABLE CASTINGS, Uses.

Plant Layouts. Heat Treating Plant for Traction Parts, Edmund Blasko. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 222-227, 4 figs. Notes on layout and management.

Layout of Heat Treating Plant for Tools, John J. Jones. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 228-229, 2 figs. Suggestions in regard to layout, construction and operation.

Plants. General Industrial Heat Treating Plant, William J. Merton. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 216-221, 5 figs. Analysis of factors to consider in plant.

Research. Investigations Pertaining to Heat Treating, F. J. Griffiths. Can. Machy., vol. 24, no. 5, July 29, 1920, pp. 118-120. Results of various investigations in heat treating field, including proper furnace equipment, pyrometry, forging operations, annealing and normalizing, etc. Paper presented before Am. Steel Treaters' Soc.

[See also ELECTRIC FURNACES, Heat-Treating; STEEL, HEAT TREATMENT OF.]

HEAT TREATMENT

See CAST IRON, Heat Treatment of; HEAT TREATING; NICHROME; STEEL, HEAT TREATMENT OF.

HEATING

Buildings, Heat Losses in. See HEAT LOSSES, Buildings.

Buildings, Oil Firing in. Heating Buildings by Fuel Oil. Am. Architect, vol. 116, no. 2291, Nov. 19, 1919, pp. 648-650. Relative cost of and relative storage space required for oil and coal.

Central Heating Plants. Standardized Central Heating and Lighting Plants for State Institutions, G. B. Nichols. Heating and Ventilating Mag., vol. 17, no. 1, Jan. 1920, pp. 32-41, 11 figs. Policy adopted by New York State, which is said to have reduced cost of plans and increased efficiency of installations.

See also District Heating Service.

See also HEAT LOSSES, Underground Steam Mains.

Coal-Stove. Tests to Determine the Efficiency of Coal Stoves, John R. Allen and F. B. Rowley. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 119-126. It is said that tests showed that best stoves are usually those which have smallest lengths of cracks and seams.

Design of Systems. Errors in Engineering Design and Operation. Heat. & Vent. Mag., vol. 16, no. 11, Nov. 1919, pp. 19-25, 2 figs. Such as failure to provide doorways or other openings of sufficient size to admit boilers and machinery or to allow of their removal as may be required at some future date.

District Heating Service. Central-Station Operation and District Heating Service, I. L. Kentish-Rankin. Elec. Rev. (Chicago), vol. 76, no. 1, Jan. 3, 1920, pp. 19-21. Writer maintains that on basis of heat production, the isolated plant existing for express purpose of producing heat and producing kilowatt-hours as by-product is more economical than central-station plant. He claims that heat passing to waste in central stations could replace many isolated plants and supply towns and settlements with heat.

Electric. See HEATING, ELECTRIC.

Factory. See HEATING, FACTORY.

Fuel-Oil Equipment for. Fuel Oil Equipment, John P. Leask. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 85-91. Includes table giving evaporation per pound of coal from and at 212 deg. fahr. and number of gallons of oil equal to ton.

Gas vs. Electricity. The Relative Merits of Gas and Electricity for Heating and Power. Gas Jl., vol. 149, no. 2963, Feb. 24, 1920, pp. 434-436. Debate at University of Birmingham (Eng.) on utilization of fuel for generation of power; industrial application of the two agents (furnaces in particular); domestic appliances (other than lighting); transmission or distribution of power.

Thermal Efficiencies of Gas and Electricity, George Helps. Gas Jl., vol. 41, no. 2987, Aug. 11, 1920, pp. 285-288, 4 figs. Also Gas World, vol. 78, no. 1882, Aug. 14, 1920, pp. 110-122, 4 figs. Reply to Dugald Clerk's comparison of electricity generation and gas production published in Gas Journal for July 14 and in Gas World for July 17.

Oil Fuel vs. Coal. Oil Fuel Versus Coal, David Moffat Myers. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 93-96. Report on oil and coal situation in large office-building plant in Philadelphia. It is said that no saving in operation at existing prices of oil and coal can be shown in favor of oil, that difference in operating cost favors coal.

Plants. Coal Consumption in Institutional Heating Plants, G. B. Nichols. Power, vol. 51, no. 17, Apr. 27, 1920, pp. 654-656, 2 figs. Deals with engineering division and its relation to operating conditions at various institutional heating, lighting and power plants. Shows diagram of organization of department of architecture as relating to engineering department, and one of daily log sheets that is applicable to all state plants.

Progress in. Progress in the Heating Industry (Neues aus der Heizungsindustrie), H. Pradel. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 8 and 10, Feb. 20 and Mar. 5, 1920, pp. 57-59 and 75-77, 27 figs. Details of Swedish, Danish, Rumanian, American and German patents for sectional boilers, dampers, sheet-steel, radiators, etc.

Railway-Train. See TRAIN HEATING.

Steam. See HEATING, STEAM.

Stoves. See STOVES.

Systems. Short Cuts to Accurate Calculations. Am. Architect, vol. 118, no. 2337, Oct. 6, 1920, pp. 450-452. Chart and table for computing steam radiation.

Systems, Corrosion of. See CORROSION, Heating Systems.

Ventilation and. See HEATING AND VENTILATION.

HEATING AND VENTILATION

Air Inlets in Window Sills. Observations of an Auditorium Having Air Inlets in the Window Sills, Samuel R. Lewis. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 415-422, 6 figs. Studies made to determine effect of arrangement of inlets and outlets on distribution of fresh air.

Beery System. Test of the Beery System of Heating and Ventilating, Clinton E. Beery. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 369-384, 14 figs. Features specially noted were (1) heating effect of system, (2) distribution of ventilation.

Fan-Blast System. An Improved Fan Blast System of Heating and Ventilating, Albert R. Klein. Heating and Ventilating Magazine, vol. 17, nos. 7 and 8, July and Aug. 1920, pp. 29-33, 6 figs., and 29-33, 5 figs. Paper enumerates advantages gained in distribution of heat and fresh air, in reduction of heat losses and horsepower, and in costs of new fan-blast heating, ventilating or cooling systems if they are pro-

vided with special "circulating" air outlets. It is further shown that existing systems can be materially improved in regard to distribution of heat and air and that, in certain cases, an increase of heating capacity can be obtained by the application of these circulating outlets.

Health and Humidity. Symposium on Health and Humidity. E. Vernon Hill and J. J. Aeberly. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 471-488, 9 figs. Subjects discussed were relation of death rate to wet-bulb temperature prevailing, and relation of wet-bulb temperature to health.

Noise Elimination in Systems. Elimination of Noises in Heating and Ventilating Systems. Heat. & Vent. Mag., vol. 17, no. 8, Aug. 1920, pp. 33-35, 7 figs. Notes on cause, effect and prevention of mechanical, air and water hammer vibrations.

Preliminary Work. Plan and Specification Data Sheets for Heating and Ventilating. Heat. & Vent. Mag., vol. 17, no. 2, Feb. 1920, pp. 29-32. Suggests forms suitable for use in preliminary work prior to design of installation itself.

Public Library, St. Paul. St. Paul Public Library Heating and Ventilating, C. S. Tompkins. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1093-1097, 7 figs. Fans are designed to make six changes of air per hour.

Research. Heating and Ventilating Research Work, Masao Kinoshita. Domestic Eng. & Estate Engr., vol. 40, no. 14, Feb. 1920, pp. 20-21. Researches carried out at London University by Research Committee of Institution of Heating and Ventilating Engineers.

Research Work in Heating and Ventilating Engineering. Ironmonger, vol. 61, no. 2429, June 5, 1920, pp. 92-93. Report of Conference called by Council of Institution of Heating and Ventilating Engineers, and attended by delegates from Royal Institution of British Architects, the Institute of Builders, Electrical Research Committee, the Institution of Gas Engineers, the Society of British Gas Industries, the British Electrical and Allied Manufacturers' Association, the Association of Engineers-in-Charge, and a Representative from Department of Scientific and Industrial Research.

HEATING, ELECTRIC

Cooking Range. British Standard Specification for Electrically Heated Cooking Range (Two Sizes). British Eng. Standards Assn., no. 106, 1920, 15 pp., 6 figs. Specifications approved on July 8, 1920.

Cost of. The Idaho Commission's Decision on Electric Heating of Houses and Buildings, George E. Erb. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 11-13. Testimony and facts before Commission showed, it is claimed, that on account of cost "it is impossible to furnish electricity for house heating as a commercial proposition in competition with wood or coal," and that "only when an excess of current is generated and may be sold as a by-product can it be used for heating purposes."

Developments in. New Heating and Cooking Apparatus. Elecn., vol. 85, no. 2210, Sept. 24, 1920, pp. 365-371, 24 figs. Survey of developments shows that electric heating and cooking continue to progress, particularly in connection with large installations for restaurants, canteens, etc. It is also noted that electric heating and cooking is becoming increasingly popular for marine work, both cargo and passenger steamers and in Navy. Equipment survey is principally of British manufacture.

Drying Ovens. Electric Heating in Steel Wire Manufacture. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 236-238, 2 figs. Comparative cost statistics taken at plant of Halcomb Steel Company on drying ovens heated electrically and similar ovens using coke and steam.

Houses. The Operating Costs of Different House-Heating Plants in the Employment of Heat Storage in Electric Heating (Die Betriebkosten verschiedener Raumheizarten und die Wärmespeicherung bei elektr. Heizung), M. Hottinger. Schweizerische Bauzeitung, vol. 76, no. 3, July 17, 1920, pp. 28-31, 10 figs. It is pointed out that water storage plants are practicable for hot-water heating, hot-water supply and for storage of high-pressure steam for technical purposes, but cannot be recommended for low- and medium-pressure steam heating. Examples are given of electric heating with heat storage.

Induction-Type Apparatus. A New Electric Heating and Cooking Apparatus (Ein neuer elektrischer Heiz- und Kochapparat), E. Fr. Russ. Elektrotechnische Zeitschrift, vol. 41, no. 4, Jan. 22, 1920, pp. 74-75, 2 figs. Description of an induction heater.

Industrial. Industrial Electric Heating, Wirt S. Scott. Elec. Jl., vol. 17, no. 5, May 1920, pp. 188-192, 13 figs. Also in Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 431-440, 7 figs. Recent applications of electric heating in various industries are pointed out and possibilities of electric heating for forging furnaces, brass-melting furnaces, hardening furnaces, tempering and annealing furnaces, sharardizing furnaces, etc., are outlined.

Switzerland. The Prospects of House Heating with Electricity in Switzerland (Die Aussichten der elektrischen Raumheizung in der Schweiz), M. Hottinger. Schweizerische Bauzeitung, vol. 75, no. 6, Feb. 7, 1920, pp. 57-60. Question is discussed of how large a part of quantity of electricity obtainable by water power in Switzerland would be available for house-heating purposes in future. Writer refers to this as a problem of great national and economic importance.

HEATING, FACTORY

Exhaust-Steam. Factory Heating (Ueber Fabrikheizung), F. Kaiser. Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, nos. 2 and 3, Jan. 31 and Feb. 15, 1920, pp. 9-10 and 21-23, 1 fig. Writer discusses most suitable heating practices and seeks to determine, in view of high cost of coal, under what conditions a factory power plant in which there would be an extensive utilization of exhaust steam would be preferable to the purchase of current.

Scandinavia. Heating and Ventilating of Workshops in Scandinavia (Litt om opvarmning av verksteden), O. Gruner Loken and Henrik Ovenberg. Teknisk Ukelblad, vol. 66, no. 44, Oct. 3, 1919, pp. 514-515 and 516, 1 fig. Air heating and ventilating arrangement of building 690 ft. long by 59 ft. wide, containing four stories each 13 ft. high. It is said that ventilation and heating of workshops by warm air is more effective than heating by radiators or stoves and that it results in increased production from workmen.

Unit Heaters. Heating With "Pipeless" Furnaces, Charles L. Hubbard. Factory, vol. 25, no. 7, Oct. 1, 1920, pp. 1050-1053, 11 figs. Types and arrangement of unit heaters.

HEATING, HOT-AIR

Radiation Losses in Ducts. Radiation Loss in Uncovered Galvanized-Iron Ducts. Heat & Vent. Mag., vol. 16, no. 12, Dec. 1919, pp. 23-26, 1 fig. With chart for figuring drop in temperature of air per 100 ft. of run.

[See also HEATING AND VENTILATION, Fan-Blast System; HEATING, FACTORY, Unit Heaters.]

HEATING, STEAM

Boiler, Magazine-Feed. The Magazine Feed Boiler and Fuel Conservation, Chas. F. Newport. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 11-16. It is said that experience testifies that most practicable and successful method of obtaining long firing period in burning smaller sizes of anthracite in heating boiler is by feeding coal into fire box from a magazine onto a sloping grate that will give uniform fuel depth for proper combustion.

Central-Station. The Great Central Heating Stations in Germany (Enquête sur les grandes centrales thermiques en Allemagne), Henry Dieterlen. Chaleur et Industrie, no. 2, Apr. 1920, pp. 85-92, 3 figs. Processes and apparatus employed for removing gas from boiler feedwater.

Heat Loss from Direct Radiation. Heat Losses from Direct Radiation, John R. Allen. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 103-118, 13 figs. Discusses theory of heat transfer from direct radiation and effect of radiation and convection, and surveys results that have been reported from experiments by different investigators on heat transmission from steam-heated radiators.

Paper Mills. See PAPER MILLS, Heating.

Radiators. See RADIATION.

Siphon Attachments. Revising Old Steam Heating Systems. Power Plant Eng., vol. 24, no. 14, July 15, 1920, pp. 686-687, 4 figs. Description of syphon attachments by means of which old types of traps and valves may be brought up to date.

Underground Main, High-Pressure. Construction and Operation of a High-Pressure Underground Steam Main, L. T. Merwin and O. LeFever. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 736-739, 4 figs. Line is 12 in. in diameter, 5654 ft. long, partly overhead and partly underground, and is used to supply steam for district heating.

Vacuum in System. Heating System Vacuum, D. N. Croathwait, Jr. Power, vol. 50, no. 17, Oct. 21, 1919, pp. 614-615, 3 figs. Argument to show that high vacuum in returning piping of heating system requires larger amount of power to operate vacuum pump.

[See also HEATING, FACTORY.]

HEATMETERS

See HEAT METERS.

HEAVY-OIL ENGINES

Allen. A New Crude Oil Engine. Engr., vol. 129, no. 3350, March 12, 1920, pp. 278-280, 9 figs. Four-cylinder hot-bulb heavy-oil engine manufactured by W. H. Allen, Son & Co., Ltd., Bedford, England. Engine is said to be capable of running at no load even when operating on heavy residual oil. Reason for this is ascribed to spherical shape of combustion chamber and to fact that, in regulating injection to suit load, governor not only varies quantity but also time of injection, so that at light load injection may take place as much as 50 deg. before dead center.

Bolinder. Notes on the Running of the Bolinder Crude Oil Marine Engine. Practical Engr., vol. 62, no. 1743, July 22, 1920, pp. 52-55, 2 figs. Care of the different parts of the engine discussed in detail, as well as actual running of engine.

Crossley. The New Crossley Cold-Starting Oil Engine, Gas and Oil Power, vol. 15, no. 171, Dec. 4, 1919, pp. 40-43, 9 figs. Engine is of four-cycle horizontal long-stroke type, cylinder bore being 18½ in., stroke 28 in. and speed 180 r.p.m.

English Types. Some Lincolnshire Oil Engines, F. H. Livens. Eng., vol. 110, no. 2848, July 30, 1920, pp. 159-162, 13 figs. Description of various types of heavy-oil engines, indicating developments in design from 1891 to 1919. Paper read before Instn. Mech. Engrs.

Fuel Selection. The Selection of Fuel Oil for Heavy Oil Engines, Allen F. Brewer. Gas Engine, vol. 22, no. 10, Oct. 1920, pp. 295-297. It is advised that customer should approach market in selection of fuel oil from angle of presenting operating conditions and peculiarities of his plant, rather than limiting himself to laboratory specifications.

Ingersoll-Rand. The New Ingersoll-Rand Stationary Engine. Gas Engine, vol. 22, no. 7, July 1920, pp. 201-205, 13 figs. Vertical multicylinder single-acting four-cycle type, having automatic ignition with low compression.

Liquid Fuel, Application of. The Application of Liquid Fuel to Heavy-Oil Engines, A. J. Wilson. Jl. Instn. Petroleum Technologists & Rec. of Trans., vol. 6, no. 22, April 1920, pp. 141-165 and (discussion), pp. 165-185, 16 figs. Compilation of data published in technical papers.

Marine. See MARINE ENGINES, Heavy-Oil.

Meaning of "Heavy Oil." The Application of Liquid Fuel to Heavy-Oil Engines, A. J. Wilson. Petroleum World, vol. 17, no. 232, Jan. 1920, pp. 23-34. Compilation of data given in technical literature concerning meaning of "heavy-oil engine" and "liquid fuel." Paper read before Instn. of Petroleum Technologists.

Price-Rathbun. New Development of the Heavy Oil Engine. Shipping, vol. 9, no. 7, Nov. 19, 1919, pp. 31-33, 1 fig. The Price-Rathbun type which is 4-cycle, low-compression, direct injection unit, cylinder compression being as low as 200 lb. per sq. in.

Steinbecker. The Steinbecker Four-Stroke Engine (Der Steinbecker Viertakt-Motor), Ernst Neuberg. Oel- u. Gasmaschine, vol. 17, no. 5, May 1920, pp. 65-71, 16 figs. Advantages over Diesel engine: Manufacturers of Diesel engines who wish to change to Steinbecker engines have only to alter cylinder head of model; cost of construction is 20 to 35 per cent less; requires no adjustment as in case of Diesel engine because of its regulating mechanism; elimination of compressor increases saving in fuel by at least 5 per cent, reduces freight and installation costs, simplifies manipulation of engine and increases safety of operation; operating costs are reduced by use of low-grade fuels not practicable for Diesel engines.

Superinduction Types. Combustion of Heavier Fuels in Constant-Volume-Type and Superinduction-Type Engines, Leon Cammen. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 941-942. Cardinal element governing design of heavy-oil engines is rate of combustion of fuel-air mixture, a requirement necessitating creation of special conditions in cylinder which will accelerate combustion. One method of doing this is by use of superinduction.

[See also DIESEL ENGINES; OIL ENGINES, Testing.]

HECTER

See GASOLINE, Hecter Fuel vs.

HELICOPTERS

Alerion. See AEROPLANES, Lacoin-Damblanc-"Alerion."

Braking in Descent. Braking Effect or Negative Traction Produced by Uncoupling the Propellers of a Helicopter in Vertical Descent (Freinage ou traction négative des helices sustentatrices débrayées dans in descente planée verticale d'un helicoptère). Aérophile, vol. 28, no. 3-4, Feb. 1-15, 1920, pp. 50-53, 3 figs. When

helicopter falls vertically, propellers, if free, will rotate and thereby take up energy of descent. It is calculated theoretically that such braking effect is probably insufficient to regulate descent within limits of safety. Experiments are suggested to investigate question further along lines which by theory alone cannot be fully investigated at present.

Experiments With. Again the Helicopter? Robert G. Skerrett. Sci. Am., vol. 121, no. 24, Dec. 13, 1919, pp. 576-577, 3 figs. Experiments of Peter Cooper Hewitt and Francis Bacon Crocker who are said to have produced helicopter which has developed lift of 4000 lb. with motor of 200 hp.

Flying without Wings, Robert G. Skerrett. Rudder, vol. 36, no. 1, Jan. 19, 1920, pp. 17-20, 10 figs. Experiments of Peter Cooper Hewitt and Francis Bacon Crocker with a view to developing helicopters.

Modern Types. Modern Helicopters (Les hélicoptères modernes), Jean-Abel Lefranc. Nature (Paris), no. 2414, July 10, 1920, pp. 21-30, 16 figs. Types developed, notably Crocker-Hewitt and Damblanc-Lacoin.

Possibilities of. The Possibilities of the Helicopter (Die Möglichkeit des Schraubenflugzeuges), Hermann Borck. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 14, July 31, 1920, pp. 207-209, 1 fig. Writer explains conditions under which a helicopter is capable of flight, and what altitudes it can reach.

Stability. See PARACHUTES, Stability.

[See also AEROPLANES, Lacoin-Damblanc.]

HELIUM

By-Products. Helium, John W. Davis. Eng. & Min. Jl., vol. 109, no. 2, Jan. 10, 1920, pp. 84-85. Commercial possibilities of helium by-products are pointed out.

Ionization Potentials of. The Ionization Potentials of Helium (Die Ionisierungsspannungen des Heliums), J. Franck and P. Knipping. Physikalische Zeitschrift, vol. 20, no. 21, Nov. 1, 1919, pp. 481-488, 7 figs. Results of experiments for exact determination of resonance potential and ionization potential for the separation of one or both electrons of helium as a guide for determination of output of energy necessary for the complete disintegration of atom into its component parts. Writers mention that results of their experiments coincide well with those of Frank Horton and Ann Davies (Proc. Royal Soc. 95, 408-429, 1919). Description of method and apparatus used for experiments.

Production and Uses. Helium: Its Production and Uses, John Cunningham McLennan. Jl. Chem. Soc., vols. 117 and 118, no. 693, July 1920, pp. 923-947, 6 figs. Also in Nature (Lond.), vol. 105, nos. 2650 and 2651, Aug. 12 and 19, 1920, pp. 747-751 and 778, 1 fig. Account of work done at experimental station at Calgary, Alberta, Canada, with a view to develop another and cheap method for separating helium from natural gas, is included.

Specific Heat of. Specific Heat of Helium and Certain Diatomic Gases (Die spezifische Wärme von Helium und einigen zweiatomigen Gasen), Karl Scheel and Wilhelm Heuse. Zeitschrift für Sauerstoff- und Stickstoff-Industrie, vol. 11, nos. 15-16 and 17-18, Aug. and Sept. 1919, pp. 57-60 and 65-67, 3 figs. Specific heats were determined by continuous-flow method with use of a calorimeter; gas circulation was effected by means of a mercury pump which is described and illustrated; results of investigations are presented in tabulated form. Discussion of results and comparison with values found by Regnault.

Spectrum of. On Intensity Relations in the Spectrum of Helium, T. R. Merton and J. W. Nicholson. Philosophical Trans. of Royal Soc. of Lond., series A, vol. 220, pp. 137-173, 3 figs. Observed phenomena are described relating to relative intensities of lines at different distances from cathode.

U. S. Plant, Fort Worth, Tex. United States Helium-Production Plant, Fort Worth, Tex., Willard A. Pollard. Public Works of the Navy, Under the Cognizance of the Bureau of Yards and Docks and the Corps of Civil Engineers, U. S. Navy, Bul. no. 31, Apr. 1920, pp. 13-46, 10 figs. Helium is extracted from natural gas by compression of incoming gas to high pressure, removal of heat of compression by circulation of cold water, progressive cooling resulting from expansion of highly compressed gas through expansion value to low pressure, and application of cold waste gases and closed external refrigerating cycles of nitrogen and CO_2 as refrigerating media. Capacity of plant is 40,000 cu. ft. of helium per day.

[See also ATTRACTION, Planetary.]

HIGH ALTITUDES

See ROCKETS, Attaining Extreme Altitudes with.

HIGH PRESSURES

Industrial Uses. Industrial Uses of Extremely High Pressures (Sur l'emploi de pressions extrêmement élevées), Georges Claude. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 649-651. Mechanical requirements of installations for producing pressures of 1000 atmospheres compared with those of installations for producing 200-atmosphere pressures.

HIGH-SPEED STEEL

See STEEL, HIGH-SPEED.

HIGH VOLTAGES

Protective Resistances for. Protective Resistance for High Voltage, H. Gewecke. Elecn., vol. 83, no. 2171, Dec. 26, 1919, pp. 746-747. Account of experiments and tests with shunts consisting of rods of copper oxide as protection for coils. Translated from Elektrotechnische Zeitschrift.

HIGHWAY CONSTRUCTION

See ROAD CONSTRUCTION.

HIGHWAY ENGINEERING

Motor-Vehicle Transportation and. Highway Engineering, W. G. Thompson. Good Roads, vol. 18, no. 14, Oct. 1, 1919, pp. 161-162. Effect of growth of motor vehicle transportation upon engineering practice in big highway work.

HIGHWAYS

American Highway Problem. The American Highway Problem, A. R. Hoist. Good Roads, vol. 19, no. 1, Jan. 7, 1920, pp. 1-5. Observes that merit and knowledge should be the sole criterion in selecting and keeping highway officials and advises making professions of highway engineering and of highway building attractive and dignified enough to encourage best engineers to embrace them.

Canada, Federal Aid in. Federal Aid, A. W. Campbell. Can. Engr., vol. 38, no. 11, Mar. 11, 1920, pp. 275-276. Act was passed July 7, 1919, by Dominion government appropriating $20,000,000 to be divided among provinces according to their population, this sum to be used in paying 40 per cent of cost of improving roads designated by provincial governments and approved by federal department of highways. Suggestions as to best manner of utilizing this appropriation in provinces are pointed out.

Classification and Uses. Classification and Uses of Highways and the Influence of Federal-Aid

Acts, Thomas H. MacDonald. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 985-988. Address before Convention of Am. Assn. of State Highway Officials.

Construction Conditions in U. S. Summary of Highway Construction Conditions in Various States. Eng. & Contracting, vol. 53, no. 1, Jan. 7, 1920, pp. 12-14. Information of construction progress in 1919 and outlook for 1920, and also on labor and material situation and recent legislation. From papers presented before Am. Assn. of State Highway Officials.

Drainage of. Highway Drainage, U. W. Christie. Can. Engr., vol. 38, no. 10, March 4, 1920, pp. 263-265. Economy in drainage is pointed out. Paper read before Assn. of Ontario Land Surveyors.

Federal Control and Aid for. The Present System of Federal Control and Aid for Highways; Its Results, Merits and Limitations, Thomas H. MacDonald. Good Roads, vol. 19, no. 2, Jan. 14, 1920, pp. 13-15 and 23-24. Modifications which in opinion of writer are necessary to make in order that "present Federal Aid Law through coöperation between the state highway department and the Federal Bureau of Roads may meet satisfactorily the national need for improved roads." Paper read before Am. Assn. State Highway Officials.

Maintenance. Developments in New York State Highway Maintenance. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 265-266, 6 figs. Among devices employed are 2-wheeled carts for cold patching and army trucks remodeled for road work.

Saskatchewan, Canada. Developments of Saskatchewan's Highway System, Charles W. Dill. Can. Engr., vol. 38, no. 8, Feb. 19, 1920, pp. 222-225. Organization and duties of department. Paper read before Association of Dominion Land Surveyors.

Snow Removal. See SNOW REMOVAL, Highways.

Tests of. New Highway Tests Being Made by the Bureau of Public Roads, A. T. Goldbeck. Good Roads, vol. 19, no. 7, Feb. 18, 1920, pp. 97-98 and 102-103. Investigations being undertaken cover (1) study of amount of impact delivered by motor trucks to roads, (2) study of effect of this impact on different types of road surfaces, (3) study of effect of traffic on different types of road surfaces, and (4) study of bearing power of subgrades as affected by moisture.

United States. The American Highway Problem, A. R. Hirst. Public Roads, U. S. Dept. of Agriculture, Bur. Public Roads, vol. 2, no. 20, Dec. 1919, pp. 6-20. Securing of trained engineering help, available supply of materials of construction, and federal policy are discussed. Highway situation in various sections of United States is separately indicated.

[See also PAVEMENTS; ROAD CONSTRUCTION; ROADS.]

HIPPODROMES

Copenhagen, Reinforced-Concrete. The New Reinforced-Concrete Hippodrome in Copenhagen (Le nouveau cirque de Copenhague, en béton armé). Génie Civil, vol. 76, no. 11, Mar. 13, 1920, pp. 273-275, 5 figs. Attention is specially directed to method of setting up reinforcing members of dome, each of which was 20 m. long and weighed 20 tons.

HOBBING MACHINES

Precision Work. Making a Hobbing Machine for Precision Work, Simeon Colley. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 491-494, 11 figs. Design and construction of special hobbing machine for producing wormwheels of accuracy required for azimuth heads.

HOISTING

Horsepower Required in. Hoisting Problem, Fred C. DeWeese. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, p. 891, 1 fig. Chart showing horsepower required and cable stress for hoisting load of 2000 lb. up various inclines.

Safety Measures. Safety Measures for Hoisting in Building Operations. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 724-725. Suggestions made by Federal Board of Vocational Education.

[See also HOISTS.]

HOISTING CABLES

See CABLES, HOISTING.

HOISTING MACHINERY

Efficiency. The Efficiency of Hoisting Machinery When Lowering the Load (Der Wirkungsgrad von Lasthebemaschinen beim Senken der Last), Leopold Feigl. Fördertechnik u. Frachtverkehr, vol. 13, nos. 6 and 7, Mar. 19 and Apr. 2, 1920, pp. 61-62 and 70-72. Points out that in hoisting machinery without worm gears the lowering capacity is not quite 1 per cent under hoisting capacity, or so slight as to be negligible. Account of experiments carried out to confirm calculated results. Basic conditions for the derived equations are given.

New Development in. A New Development in Hoisting Machinery, Warren Travell. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 49-50, 4 figs. Single drum is used to control horizontal and vertical movements and dead load is balanced by counterweight.

Standardization. Important Considerations in Regard to Standardization (Wichtige Gesichtspunkte bei Normalisierungen), R. P. Schröder. Fürdertechnik u. Frachtverkehr, vol. 13, no. 5, Mar. 5, 1920, pp. 50-52. Notes on basic principle of standardization of parts, with examples demonstrating suitable and tested applications; investigation of standards presented by German Engrs.; and suggestions for improvement of method now in use.

[See also HOISTS.]

HOISTS

Electric. An Electrically-Driven Wagon Hoist in a Steel Works. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 692-693, 5 figs. Hoist is of usual table type, with four sets of hoisting ropes in parallel, each set being directly connected to each corner.

Designing an Electric Hoist to Meet Needs of a Long Mine Slope, Graham Bright. Coal Age, vol. 17, no. 19, May 6, 1920, pp. 890-894, 10 figs. Hoist consists of single cylindrical drum 9 ft. in diameter, having ultimate capacity of about 13,000 ft. of 1¼-in. cable. Drum is geared to 800-hp., 2200-volt, three-phase 60-cycle, 24-pole, pedestal-type, wound-rotor, induction motor.

Development of Portable Electric Hoists. Coal Industry, vol. 3, no. 5, May 1920, pp. 229-230, 3 figs. Details of a new type of hoist which is said to fill all requirements of successful room hoist, which are enumerated.

Electrically-Driven Hoisting Machine (Machine d'extraction à commande électrique). Industrie Électrique, vol. 29, no. 676, Aug. 25, 1920, pp. 305-307, 2 figs. Ward-Leonard type. Hoist is driven by d.c. motor excited by independent generator. Speed of motor is controlled by varying current supplied by generator.

Electrically-Driven Hoists, Fraser Jeffery. Power, vol. 51, no. 8, Feb. 24, 1920, pp. 286-288, 7 figs. Notes on unbalanced single-drum hoisting and more efficient balanced hoist employing a second cage or a counter-weight. Character of load imposed by different types

of hoist and different hoisting depths is described. Details of electric braking and comparison of full magnetic and liquid control.

Modern Electric Hoists (Neuzelitliche Motorflaschenzüge), Ernst Blau. Fördertechnik u. Frachtverkehr, vol. 13, no. 5, Mar. 5, 1920, pp. 54-56, 2 figs. States their advantages and describes spur-gear electric hoist of the German Machine Works Corp. (Demag) in Duisburg, built for loads up to 5 tons.

See also Mine.

Hydraulic. See MOTOR TRUCKS, Hydraulic Hoist for.

Mine. A New Depth Indicator for Mine Hoists (Ein neuer Teufenzeiger für Fördermaschinen), Wilh. Weber. Fördertechnik u. Frachtverkehr, vol. 13, no. 4, Feb. 20, 1920, pp. 40-41, 1 fig. Device constructed by W. Weber & Co., Wiesbaden, for indicating exact position of cage, etc.

Electric Winding Engines and Mine Hoists, H. H. Broughton. Elecn., vol. 84, nos. 2182, 2184, 2186, 2188, 2190, 2194 and 2195, Mar. 12, 26, Apr. 9, 23, May 7, June 4 and 11, 1920, 31 figs., and vol. 85, nos. 2199 and 2201, July 9 and 23, pp. 54-55 and 104-106, 6 figs. Methods of estimating moments of inertia and tables indicating inertia of rotors; rating winder motors; geared three-phase window for shaft of uniform slope; calculations involved in design of mine hoist; notes on static moments, accelerating and retarding moments; discussion of compound shafts; calculations leading to determination of torque diagram for a complex compound shaft; resultant static load at drum radius, accelerating and retarding forces, etc.

Factors to be Considered in Calculating Proper Hoist for Specific Conditions, M. A. Whiting. Coal Age, vol. 18, no. 13, Sept. 23, 1920, pp. 630-637, 10 figs. Nine cases are considered as means of arriving at duty that will be required for mine hoist. Paper read before Engineers' Society of Western Pennsylvania.

Hoisting Equipment at Utah Apex Mining Co., J. A. Norden and A. R. Wilson. Min. & Metallurgy, no. 163, July 1920, pp. 31-33, 2 figs. A Nordberg engine of double-drum, geared type, designed for a 10-ton load, including rope, at a speed of 1500 ft. per min. is used; hoist is operated by a 500-hp., 16-pole, round-rotor, 450-r.p.m. motor, which drives through a single reduction of 129 to 19; a sodium-carbonate solution is used as a conductor. Gives cost of installation.

Mine Hoist to Carry One Hundred Men. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 456-457, 2 figs. Hoist, which is a single-drum motor-driven type is designed to operate in balance at rope speed of 800 ft. per minute.

Mine Safety Experts Discuss at Milwaukee Accidents, Health and Warfare—II, R. Dawson Hall. Coal Age, vol. 18, no. 16, Oct. 14, 1920, pp. 801-806. Safety devices on hoisting engines. Paper read before Nat. Safety Council.

Progress in the Electrification of Mine Hoists, R. S. Sage. Coal Age, vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 770-776, 11 figs. It is noted that electrification of mine hoists proceeded slowly for many years, chiefly because of their intermittent operation and high peak loads to which they were subject. Difficulties have been so successfully overcome, however, that at present over 85 per cent of new installations are electrically driven.

See also Electric; COAL MINING, Hoisting; MINE HOISTING.

Safety Brakes for. Increase of Safety against Falling and Increase of Efficiency in Hoists and Shaft Installations (Absturzsicherheit und Leistungserhöhung bei Aufzügen und Schachtanlagen), F. Jordan. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 34 and 35, Aug. 21 and 28, 1920, pp. 661-664 and 697-700, 9 figs. Discusses failures of safety brakes on hoists and hauling machines; unprofitableness of present high safety coefficient for rope and possibility of its reduction in mine practice; advantages of a braking device with compressed-air operation; arrangement and operation of the Jordan compressed-air brake; results of safety brake tests.

Single-Drum Hoisting and Traversing. A New Development in Hoisting Machinery, Warren Travell. Freight Handling & Terminal Eng., vol. 5, no. 10, Oct. 1919, pp. 380-382, 3 figs. Apparatus in which single drum is used for both vertical hoisting and horizontal traversing.

Skip. New Skip-Hoist Designed, Warren Travell. Coal Trade Jl., vol. 51, no. 37, Sept. 15, 1920, pp. 1043-1044. Machine combining horizontal transportation with hoisting operation.

Slope. See COAL MINING, Hoisting.

HOOKWORM ERADICATION

See COAL, Production, Hookworm Disease and.

HOSE

Fire. See FIRE HOSE.

Flexible-Metal. The Manufacture and Uses of Flexible Metal Hose (Der Metallschlauch, seine Herstellung und Verwendung), Metall-Technik, vol. 46, no. 11-12, Mar. 18, 1920, pp. 42-43, 10 figs. Usually made in lengths of 4 to 42 m. and up to 50 cm. diam. Suggestions for joining sections together, for protection against destruction and repair. Used for conveying coal, grain, ashes, etc.; distributing water, oil, gas, steam, etc.; for fire-extinguishing, suction dust collecting purposes, etc.

Steam. See STEAM HOSE.

HOSE COUPLINGS

Threads. Standardization of Hose Coupling Threads. Fire & Water Eng., vol. 67, nos. 2 and 3, Jan. 14 and 21, 1920, pp. 83-85 and 97 and 169, 5 figs. Jan. 14: Report of Committee on Fire Prevention and Engineering Standards of National Board of Fire Underwriters. Jan. 21: Field results obtained and tools in use.

HOSPITALS

Emergency. Emergency Hospital and Lecture Room of Pittsburgh Terminal Company. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 745-746, 3 figs. Combination hospital and lecture room buildings constructed by coal company in Pittsburgh district.

Shop. The Machine Shop Hospital, Sanford DeHart. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 38-40, 1 fig. Operation of shop hospital at plant of R. K. LeBlond Machine Tool Co., Cincinnati.

HOT-AIR ENGINES

Fundamentals. Technology of Air as a Power Medium, Jacques S. Negru. Compressed Air Mag., vol. 25, no. 10, Oct. 1920, pp. 9834-9836, 4 figs. Fundamentals of hot-air engines.

HOT-AIR HEATING

See HEATING, HOT-AIR.

HOT-WATER SUPPLY

Piping, Rust Prevention in. The Prevention of the Red-Water Plague, Wm. H. Walker. New England Water Works Assn., vol. 34, no. 1, March 1920, pp. 33-38 and (discussion) pp. 38-48, 6 figs. System for deactivation of water

which has been installed in large apartment house in New York City.

HOTELS

King Edward, Toronto. Addition to King Edward Hotel, Toronto, V. J. Blackwell. Contract Rec., vol. 34, no. 33, Aug. 18, 1920, pp. 777-779, 4 figs. Enlargement expected to make hotel largest in Canada. Steel construction with concrete floors.

HOURS OF WORK

See LABOR, Hours of Work.

HOUSES

British Construction Methods. British House Building Methods, Charles T. Ruthen. Building News, vol. 117, nos. 3380 and 3381, Oct. 17 and 24, 1919, pp. 331-332 and 337-338, 3 figs. Oct. 17: Economic aspect of housing problem in Great Britain. Oct. 24: Weatherproof houses that have been erected at Newton in a few weeks and were ready to be tenanted immediately. Also in Surveyor, vol. 56, no. 1449, Oct. 24, 1919, pp. 241-244, 4 figs.

Bungalows. Bungalows of Approved Design. Contract Rec., vol. 34, no. 35, Sept. 1, 1920, pp. 828-829, 4 figs. Examples of popular type of dwelling arranged to meet requirements of cold climate.

Clay. Arguments Against Clay Construction (Gegen die Lehmbauweise), Franz Hoffmann. Tonindustrie-Zeitung, vol. 43, nos. 149, 150 and 152, Dec. 18, 20 and 25, 1919, pp. 1343-1345, 1352-1353 and 1372-1373, 1 fig. Writer seeks to demonstrate that the saving in coal with clay construction is by no means so great as is generally believed and durability of clay houses is about 50 per cent less than that of brick houses.

Cold-Proof. A Cold-Proof House in Saskatoon, Randolph Patton. Concrete, vol. 16, no. 1, Jan. 1920, pp. 8-11, 5 figs. Walls are built of pebble-dash stucco and roof of tar and gravel. It is said that house can be heated by electricity without prohibitive expense.

Concrete. See HOUSES, CONCRETE.

Cost of, Increased. How House Building Costs Have Increased Since 1913, LeRoy K. Sherman. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 267-271, 1 fig. Figures compiled by U. S. Housing Corporation showing that small house built for $4117 in 1913 would have cost $6833 in spring of 1919.

Cottages. Construction of Small Cottages (Kleine Wohnhäuser), Schweizerische Bauzeitung, vol. 74, no. 17, Oct. 25, 1919, pp. 209-211, 11 figs. Cheap type of workmen's houses constructed of wood and concrete, designed by Swiss architects.

Standard Specification for Cottages. Concrete & Constructional Eng., vol. 14, nos. 10 and 11, Oct. and Nov. 1919, pp. 565-570 and 664-669. Approved by Ministry of Health.

See also HOUSES, CONCRETE, Cottages.

Pisé de Terre. Pisé de Terre and Its Possibilities, Clough Williams-Ellis. Surveyor, vol. 57, no. 1466, Feb. 20, 1920, pp. 183-184. Definition of pisé de terre and plant required for pisé building; method of construction and extracts from specifications of house built of pisé.

Residence Design. Large 8-Roomed Residence. Contract Rec., vol. 33, no. 44, Oct. 29, p. 1011, 3 figs. Rooms are designed to provide suites separate from rest of house.

Slag-Sand Brick. Construction of Houses with Slag-Sand Brick (Heimstättenbau in Schlackensand-Profilsteinen), A. Guttmann. Stahl u. Eisen, vol. 40, no. 27, July 8, 1920, pp. 909-912, 14 figs. Experiences in Westphalia show that blast-furnace slag-sand brick will probably fulfill requirements of small-house construction in limited industrial districts to a marked degree.

Stucco. Successful Building in Stucco. Am. Architect, vol. 16, no. 2290, Nov. 12, 1919, pp. 615-621, 16 figs. Illustrates hollow wall tile construction.

See also Cold-Proof.

Walls, Heat Permeability of. A Simple and Practical Method for Determining Insulation of Various Forms of Building Construction (Ein einfaches, praktisches Verfahren zur Bestimmung des Wärmeschutzes verschiedener Bauweisen), Karl Hencky. Gesundheits-Ingenieur, vol. 42, no. 46, Nov. 15, 1919, pp. 469-472, 3 figs. Method for determining heat permeability of walls which, it is claimed, is specially adaptable for examination of walls of completed houses.

HOUSES, CONCRETE

Block and Tile. Concrete Block and Tile House Construction. Contract Rec., vol. 34, no. 19, May 12, 1920, pp. 441-443. Code of recommended practices for concrete block and tile house construction reported by special committee to Nat. Conference on Concrete House Construction.

Recommended Practice for Block and Tile House Construction. Concrete Products, vol. 18, no. 5, May 1920, pp. 19-21, 1 fig. Report of Sub-Committee A of Nat. Conference on Concrete House Construction.

Block Construction. Concrete Cottage Building. Concrete & Constructional Eng., vol. 15, no. 1, Jan. 1920, pp. 24-32, 8 figs. Patent concrete building blocks as used by Concrete Buildings, Ltd.

Local Authorities and Housing. Surveyor, vol. 58, no. 1499, Oct. 8, 1920, pp. 235-236, 2 figs. Plan of constructing houses on continuous cavity system at Brighton.

Cottages. Concrete Cottage Building. Concrete & Constructional Eng., vol. 15, no. 2, Feb. 1920, pp. 84-91, 7 figs. Basis of construction is steel frame encased in expanded metal, which forms reinforcement for concrete outside walls, inside walls being of slabs.

Double-Wall. How Will the Individual Builder Get a Concrete House? Harvey Whipple. Concrete, vol. 16, no. 1, Jan. 1920, pp. 1-2 and 27-36, 16 figs. Illustrates construction of double monolithic wall with double-wall machine.

England. Concrete Cottage Building Cottages at Amesbury. Concrete & Constructional Eng., vol. 15, no. 4, April 1920, pp. 234-242, 5 figs. Thickness of walls is 7½ in., and they are composed of two 2½-in. skins with a 2½-in. cavity. Two inch blocks were used which in tests showed contraction of 1/512 in. in 27 in. at 20 deg. fahr. below freezing, and expansion of 1/127 in. in 27 in. at 120 deg. fahr.

Fire Tests. German Fire Tests on Reinforced Concrete Houses, Arthur Holmes. Concrete & Constructional Eng., vol. 15, no. 6, June 1920, pp. 406-410, 4 figs. From report on tests published in Deutscher Ausschuss für Eisenbeton, no. 33, p. 66, 1916, Berlin.

Gunite Construction for. New Method of Gunite Construction Reduces Cost to Fifty Cents per Square Foot, R. H. Gillespie. Can. Engr., vol. 38, no. 21, May 20, 1920, pp. 480-482, 6 figs. Description of house referred to in report of "Cement-Gun" Committee of Nat. Concrete Housing Assn., advantages of which are said to be rapidity and ease of construction, fireproof qualities, absolutely perfect insulation and protection against heat and cold, permanency and economy.

Ingersoll Type. All-Concrete and also Frame Houses for the Comfort of Industrial Employees.

Compressed Air Mag., vol. 25, no. 1, Jan. 1920, pp. 9509-9512, 15 figs. Models built in C. H. Ingersoll molds.

Compact Concrete Houses for Industrial Workers. Cement and Eng. News, vol. 32, no. 1, Jan. 1920, pp. 26-29, 7 figs. Method of building Ingersoll type of house.

Long Island. Concrete Houses on Long Island, N. Y. Concrete, vol. 17, no. 1, July 1920, pp. 31-33, 13 figs. Monolithic concrete structures.

Mass Production. Concrete Cottage Building. Concrete, vol. 15, no. 7, July 1920, pp. 450-457, 6 figs. How enterprising local authority, making full use of resources at its disposal, developed housing scheme of 250 houses built almost throughout of concrete bricks, and roofed with concrete tiles.

Mass Production of Cottages. Concrete, vol. 15, no. 7, July 1920, pp. 470-474, 2 figs. Discussion of pre-cast reinforced concrete houses erected by machinery. Writer believes this to be most rapid and economical method of building construction.

Monolithic. Field Practice on Monolithic Concrete Houses. Contract Rec., vol. 34, no. 14, April 7, 1920, pp. 329-331. Outline of practicable erection methods. Report presented at National Conference on Concrete House Construction.

Systems of Monolithic Concrete House Construction. Eng. and Contracting, vol. 54, no. 8, Aug. 25, 1920, pp. 179-182, 8 figs. Description of various systems of molds used in constructing monolithic concrete houses. From proceedings of national conference on Concrete House Construction.

Texas Houses Combine Precast and Monolithic Construction, Stuart B. Moore. Concrete, vol. 16, no. 6, June 1920, pp. 249-254, 10 figs. Constructional methods employed by Turner Construction Co.

Morrill Type. The Easy-to-Keep House, Milton Dana Morrill. Concrete, vol. 16, no. 1, Jan. 1920, pp. 37-42, 20 figs. Type designed to be built with monolithic concrete walls by Morrill system and for group construction in suburban development.

Olympia Show. Housing Exhibition at Olympia. Concrete & Constructional Eng., vol. 15, no. 3, March 1920, pp. 193-198, 8 figs. Examples of methods of small house construction which have been approved by Ministry of Health as suitable for use in connection with housing schemes.

One-Piece. Houses by the Bucketful, Floyd Hamilton Hazard. Sci. Am., vol. 121, no. 23, Dec. 6, 1919, p. 553, 1 fig. One-piece concrete house that is said to be built in ten days.

Plastered Type. Plastered or Concrete Types of Concrete Houses. Eng. & Contracting, vol. 53, no. 12, March 24, 1920, p. 325. Committee report presented at National Conference on Concrete House Construction.

Rapid Construction. Comfortable and Permanent Industrial Homes of Concrete. Compressed Air Mag., vol. 25, no. 5, May 1920, pp. 9649-9650, 2 figs. Industrial housing project sponsored by Ingersoll-Rand Co. of New York for its factory employees at Phillipsburg, N. J.

Specifications. Specifications for Cement Concrete Buildings. Concrete and Constructional Eng., vol. 15, no. 8, Aug. 1920, pp. 539-541. Specifications for cement concrete building approved by British Ministry of Health.

Steel Forms. Moulding Houses in Steel Forms for War Workers, Milton Dana Morrill. Cement & Eng. News, vol. 31, no. 11, Nov. 1919, pp. 36-38, 10 figs. Concrete houses built of cinder concrete mixed in proportion of one part cement, 2½ parts sand and 5 parts cinders.

HOUSING

Akron Rubber Companies. Building Industrial Communities, A. J. Hain. Iron Trade Rev., vol. 67, no. 7, Aug. 12, 1920, pp. 441-444, 7 figs. Housing scheme constructed by Akron Rubber Companies, involving business centers, recreation facilities and even trade "university."

British Government's Scheme. The British Government's Huge Housing Scheme, E. J. Mehren. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 217-218. Means being taken by British Government to promote and subsidize housing enterprises.

Canada. Industrial Housing Development, Harold R. Watson. Can. Manufacturer, vol. 39, no. 12, Dec. 1919, pp. 53-57, 7 figs. Illustrating recent work under Housing Act.

Capreol, Ont. Box Car Dwellings and Shacks Give Way to Real Homes at Capreol, Ont., W. H. Mathews. Contract Rec., vol. 33, no. 53, Dec. 31, 1919, pp. 1198-1201, 10 figs. Design and costs of homes erected by Capreol Housing Commission.

Concrete Construction. See CONCRETE, Housing, Employment in; HOUSES, CONCRETE.

Eliminating Slums. Eliminating the Slums, Emile G. Perrot. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June 1920, pp. 235-241, 15 figs. Danger of unfit housing is pointed out as well as economic advantages resulting from erecting sanitary industrial houses. Typical models in industrial villages in England and United States are illustrated.

Financing. Methods of Financing Housing Schemes. Contract Rec., vol. 34, no. 35, Sept. 1, 1920, pp. 830-832. Several plans outlined at Nat. Conference on concrete-house construction.

Garden City Scheme, London. Unpopulating London, John Irwin Bright. Jl. Am. Inst. of Architects, vol. 8, no. 10, Oct. 1920, pp. 354-356, 2 figs. Housing scheme prepared by Garden Cities and Town Planning Assn., London. Instead of houses being packed together, it is proposed to create separate "Garden Cities" with population from 30,000 to 50,000, at convenient distances apart and ready for communication with center of metropolis.

Hygiene and Ventilation. Hygiene and Ventilation in Relation to the Housing Problem, Leonard Hill. Domestic Eng. & Estate Engr., vol. 39, no. 12, Dec. 1919, pp. 171-177. Suggested rules to follow in design of houses. Paper read before British Commercial Gas Assn.

Industrial. Company Housing in Anthracite Region of Pennsylvania, Leifur Magnusson. Monthly Labor Rev., vol. 10, no. 5, May 1920, pp. 186-195, 5 figs. Based on survey by Bureau of Labor of 6853 dwellings. Types of houses used are described and data is given in reference to cost of maintenance, administration, etc.

Home Owning Plan of Corporation is Popular. Iron Age, vol. 105, no. 25, June 17, 1920, pp. 1730-1732, 8 figs. Types of houses being built for employees by United States Steel Corporation.

Industry Solving House Problem, A. J. Hain. Iron Trade Rev., vol. 66, no. 26, June 24, 1920, pp. 1832-1839. Manufacturers providing homes for employees while individual building comes to halt. Iron and steel producers offer funds to finance 100,000 dwellings, 10 per cent of nation's shortage.

Manufacturers' Housing Problems, Harold R. Watson. Can. Manufacturer, vol. 40, no. 8, Aug. 1920, pp. 47-52, 6 figs. Housing problem developed by Borders Housing Co., Canada.

The Financial Problems of Industrial Housing, Leslie H. Allen. Mech. Eng., vol. 42, no. 6, June 1920, pp. 346-348. Housing shortage

is said to be due partly to fear of financial panic and partly to fact that, high as rents are, they are not high enough to show adequate return on present-day construction costs. Relation of rents to capital invested, calculation of proper rents, and methods of financing house construction are discussed. A scheme of co-operative housing is suggested as solution of present housing problems.

Your Housing Problem. Factory, vol. 24, no. 8, May 1, 1920, pp. 1317-1323, 10 figs. Ideas for meeting it, drawn from an investigation among 1,000 industrial concerns.

Influence on Production and Turnover. The Workman's Home, Leslie H. Allen. Sci. Am. Supp., vol. 88, no. 2289, Dec. 6, 1919, pp. 330-331. Its influence upon production in the factory and labor turnover. Paper read before Am. Soc. Mech. Engrs.

London Problem. The Problem of London Housing, W. R. Davidge. Jl. Roy. Inst. British Architects, vol. 27, no. 3, Dec. 6, 1919, pp. 41-51 and (discussion) pp. 51-55, 3 figs. Schemes which have been proposed to provide housing accommodations needed and to clear slums.

Mining Towns. Kaska, a Mining Town in the Rebuilding. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 747-750, 12 figs. Each family has seven rooms and bath, furnace, radiators in every room, electric lighting and cemented cellar. All buildings of vitrified tile; some covered with stucco. Two large porches on every house.

Railroad Cars for. Atmospheric Heating System for Railroad Cars, Thos. H. Ireland. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 363-368, 2 figs. How lumber company improved living conditions of its workmen by fitting up 12 railroad cars for housing of men.

Schemes. Big Scale Home Building by Motor Corporation. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, p. 11. Types of buildings constructed and material used in housing scheme worked out by General Motors Corporation at Flint, Mich.

Housing Development of the Viscose Company, Emile G. Perrot. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 324-326, 5 figs. Plan and details of industrial village.

Toronto, Ont. The Work of the Toronto Housing Commission. Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1041-1042, 2 figs. Types of houses being erected by the commission for use of workingmen. Two styles costing from $3,800 to $4,000.

Transient Workers. Some Sidelights on Construction Work, N. L. Rea. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 913-917, 9 figs. Concerning specially living conditions for men engaged in transportation of materials and questions of assembly and erection as influenced by local conditions.

Walkerville, Ont. Industrial Housing at Walkerville, Ont., Norman C. McEachren and Wm. H. Martin. Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1154-1158, 7 figs. Constructional details of houses built.

Wall Construction. The Three-ply Salvage Wall, E. A. Slater. Surveyor, vol. 66, no. 15-18, Oct. 1919, pp. 223-224, 4 figs. As submitted for examination to Standardization and Construction Committee, which has recommended this construction for national housing in England.

Wartime, Government. Community Values in Government Housing, George Gove. Am. City, City Edition, vol. 22, no. 1, Jan. 1920, pp. 1-7, 5 figs. Housing schemes built by U. S. Government during war.

Winnipeg Scheme. Homes Built under Winnipeg Housing Scheme, F. H. Parr. Contract Rec., vol. 34, no. 35, Sept. 1, 1920, pp. 835-836, 2 figs. Terrace houses most economical, but difficult to sell. Description of semi-detached cottages. Permanent class of construction.

[See also HOUSES, British Construction Methods; HOUSES, CONCRETE; CITY PLANNING, Legislation in 1919; PAPER MILLS, 100-Ton Mill.]

HOWITZERS

Axletrees, Forging. British Railway Workshops in War Time. Engr., vol. 130, no. 3369, July 23, 1920, pp. 77-78, 2 figs. Alternative methods of forging howitzer axletrees adopted at Eastleigh shops of London and Southwestern Railway, England.

British 12-In. 12-Inch Howitzer on Railway Truck Mounting. Engr., vol. 130, no. 3374, Aug. 27, 1920, pp. 204 and 209, 3 figs. Howitzer consists of nickel-steel barrel which is wound with successive layers of wire ribbon over breech portion for about one-third of its length. Jacket is shrunk on whole length of barrel.

Schneider 155-Mm. The Schneider 155-MM. Howitzer. Eng., vol. 109, no. 2831, Apr. 2, 1920, pp. 442-443, 5 figs. Particulars: Wheel track, 5 ft.; diameter of wheels, 4 ft. 4½ in.; total length of gun team with pole, 32 ft. 11 in.; weight, complete in firing position, 7273 lb.

HOWLER SET

See OSCILLATIONS, High-Frequency.

HUMAN BODY

Conductivity of. See ELECTRIC CONDUCTORS, Human Body, Conductivity of.

HUMIDITY

See HEATING AND VENTILATION, Health and Humidity.

HYDRANTS

Freezing, Protection Against. Fire Hydrant Maintenance in Cold Weather. Fire & Water Eng., vol. 67, no. 4, Jan. 28, 1920, pp. 212-213, 2 figs. How hydrants should be set to prevent freezing. Method of inspecting and testing hydrants.

The Care of Fire Hydrants in Winter Weather in Montreal, T. W. Lesage. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 137-138, 1 fig. Organization of staff of inspectors.

HYDRATORS

Schaffer. See LIME, Hydrated-Lime Plant.

HYDRAULIC PACKING

See PACKING, Steam and Hydraulic.

HYDRAULIC PRESSES

See also FORGING, Hydraulic-Press.

HYDRAULIC TURBINES

Bauersfeld Blading. Experiments on a Turbine Runner with Bauersfeld Blading. (Versuche an einem Turbinen-Laugrad mit Bauersfeld-Schaufelung), Ernst Reichel. Zeitschrift für das gesamte Turbinenwesen, vol. 16, nos. 33, 34 and 35, Nov. 30, Dec. 10 and 20, 1919, pp. 353-356, 369-372 and 377-379, 14 figs. Description and results of experiments with a turbine having blades constructed according to design of Dr. Bauersfeld, in which, it is said, main current flows free of eddies.

Buckets. Increasing the Life of Turbine Buckets (Erhöhung der Lebensdauer von Turbinenschaufeln), Hans Schneider. Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 1, Jan.

10, pp. 8-9, 2 figs. Quotes suggestion of Schoop that metal-spraying process developed by him be applied to turbine buckets to increase their durability.

Design. Analytical Theory of Hydraulic Turbines (Essai d'une théorie analytique des turbines hydrauliques), A. Petot. Technique Moderne, vol. 12, no. 8, Aug. 1920, pp. 332-336. Formulæ for determining elements of reaction turbines.

Design of the 37,500-Hp. Turbines at Niagara, George R. Shepard, Norman R. Gibson, Lewis F. Moody and W. M. White. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 646-653, 6 figs. Hydraulic features of 100,000-hp. addition to the hydroelectric power plants on American side of the Great Falls. Design of the two types of turbines.

Features of Design in Large Hydraulic Turbines, F. H. Rogers. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 849-852, 5 figs. Relative importance of losses occurring in penstock, runner and draft tube at various heads and specific speeds is discussed and attention is called to conditions under which certain of these losses become sufficiently important to warrant exercising considerable effort to minimize them.

Developments. Evolution of the Modern Hydraulic Turbine (Les turbines hydrauliques modernes et leur évolution), Denis Eydous. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs Civils de France, vol. 73, nos. 1-2-3, Jan.-March 1920, pp. 93-124, 15 figs. Modern turbines for medium and high heads are considered as highly perfected and being susceptible of only minor improvements concerning minor mechanical details. Turbines for utilizing variable low heads can be designed, it is believed, with several wheels mounted on the same axis, water being admitted on only part of these when head is high and on all together when it diminishes.

Modern Developments of Hydraulic Turbine Design, Robert E. Horton. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 683-685. Precedent and principle as exemplified in new Niagara wheels. Minimum constraint a factor in efficiency.

Jensen and Dahl Types. Manufacture of Water Turbines in England. Elec. Rev. (Lond.), vol. 87, no. 2226, July 23, 1920, pp. 100-102, 5 figs. Description of Jensen and Dahl turbines which are to be manufactured by Messrs. Sir W. G. Armstrong, Whitworth and Co., Ltd., of London.

Kaplan. The Kaplan Hydraulic Turbine. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 516-517, 5 figs. Development of Francis type. Water flows throughout runner in axial direction and deflection of water in runner is eliminated. Guide apparatus is designed in same manner as in conventional Francis turbines, but vanes are so arranged that water discharges not only along longitudinal edges, but also at front edges. Translated from Zeitschrift des Bayerischen Revisions-Vereins.

See also Tests.

Niagara Falls Power Co. Features of 37,500-Hp. Water Turbines. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 679-682, 8 figs. Allis-Chalmers hydroelectric units installed at plant of Niagara Falls Power Co.

Pelton Jet Deflector. A Centrifugal Pelton Jet Deflector. Engr., vol. 129, no. 3362, June 4, 1920, p. 583, 5 figs. Describes form of jet nozzle designed by P. W. Seewer, providing a simple means of cutting off the driving supply of water to the wheel without subjecting pipe line to shock by checking velocity of water in the pipe.

Pelton Type. Pelton Wheel Reconstruction, Percy Pitman. Eng., vol. 109, no. 2843, June 25, 1920, pp. 851-853, 13 figs. Reconstruction carried out at large ammunition works during war period to replace defective and broken buckets and to economize in water by fitting on buckets of more modern and efficient type.

Pipe Lines, Minimum-Cost. The Value of a Hydraulic Horsepower at the Wheel, W. Rettger. Cornell Civ. Engr., vol. 28, no. 2, Nov. 1919, pp. 62-69. Formulæ for determining diameters of sections of steel pipe, which will give minimum cost of pipe.

Runner, New Type of. A New Type of Hydraulic-Turbine Runner, Forrest Nagler. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 921-925, 7 figs. Design is based on straight radial blade, which is said to offer absolute minimum of wetted surface and of bending moment on root of blade. From direction of flow it is characterized as pure Jonval type. Writer expects that this waterwheel runner, because of its simplicity and inexpensiveness, will supersede mixed-flow or Francis type.

Seewer Governor. Seewer's Method of Regulating High-Head Pelton Wheels (Seewers Universalregelung für Hochdruck-Pelton-Turbinen), F. Prásil. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 48, Nov. 29, 1919, pp. 1194-1200, 24 figs. Discusses principle of jet dispersion and its realization by means of movable guide plates in the nozzle. Description of construction and operation based on verbal and written report of Seewer, as well as observations of writer and his assistants during tests. Results of experiments are presented with aid of tables and diagrams.

Sewer Universal Governor for High-Pressure Pelton Turbines (Le régulateur universel système Seewer pour turbines hydrauliques à haute chute (Pelton)), L. Joeffre. Revue générale de l'Électricité, vol. 6, no. 26, Dec. 27, 1919, pp. 935-940, 7 figs. Deviation of jet is accomplished by dispersing it by means of guiding elements placed in interior of piping. Successful operation of this governor is said to have been secured in trials at laboratories of Zurich Polytechnic School.

Specific Speed. Note on the "Specific Speed" of Hydraulic Turbines (Note sur le "nombre de tours specifique" des turbines hydrauliques), L. DuBois. Bulletin Technique de la Suisse Romance, vol. 45, nos. 21 and 22, Oct. 18 and Nov. 1, 1919, pp. 217-219 and 231-234, 6 figs., and vol. 46, no. 1, Jan. 10, 1920, pp. 3-5, 5 figs. Oct. 18: How to establish equation expressing relation between head, power and number of revolutions. Nov. 1: Francis turbines. Jan. 10: Horsepower-head graphs for Pelton turbines with $n_s = 26$ and $n_s = 36$, and for Francis turbines with $n_s = 50$, $n_s = 250$ and $n_s = 450$.

Testing Station. New Water-Turbine Testing Station of Briegleb, Hansen & Co., Gotha (Die neue Wasserturbinen-Versuchsanstalt von Briegleb, Hansen & Co., in Gotha), D. Thomas. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 17, June 20, 1919, pp. 165-168, 7 figs. partly on supp. plate. Description of testing apparatus.

Tests. Results of Brake Tests of a Kaplan Turbine (Bremsergebnisse an einer Kaplanturbine), Berthold Blümel. Elektrotechnik u. Maschinenbau, vol. 38, no. 6, Feb. 8, 1920, pp. 61-63, 8 figs. Tests of high-speed, high-efficiency turbine of about 40 hp. operating under head of 8 to 10 ft.

Wear. The Wear of Hydraulic Turbines, Its Consequences and the Method of Reducing It (L'usure des turbines hydrauliques, ses consequences et les moyens d'y parer), Henri Dufour. Bulletin technique de la Suisse Romande, vol. 45, no. 26, Dec. 27, 1919, pp. 280-281, 2 figs., and vol. 46, nos. 3, 4, 7, 9 and 12, Feb. 7, 21, April

3, May 1 and June 12, 1920, pp. 25-26, 37-41, 75-78, 97-100 and 133-140, 21 figs. Also in Bulletin Technique du Bureau Veritas, vol. 1, no. 7, Dec. 1919, pp. 267-269. Estimated amount of alluvial loams passing through turbine installation in Switzerland; suggested improvement of apparatus for precipitating loams; experiments to determine extent of lowered efficiency of turbine by wear caused by loams; records of operation of sand settling basin in hydroelectric plant in Switzerland.

[See also WATER POWER, Utilization of.]

HYDRAULICS

Manning Formula, Chart for. Another Diagram for Solving the Manning Hydraulic Formula, R. D. Goodrich. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 648-649, 1 fig. Prepared to facilitate hydraulic computations involved in investigation of river and flood channels preliminary to design of regulation of river system.

Pressures, Polygon of. Liquid-Pressure Force Polygon (Die Flüssigkeitsseillinie), E. Jocoby. Zentralblatt der Bauverwaltung, vol. 30, no. 95, Nov. 22, 1919, pp. 565-567, 5 figs. Tables, diagrams and formulæ are presented which demonstrate the saving in thickness of walls or large metal tanks such as gasholders that can be effected by the application of the so-called liquid-pressure force polygon in their design.

Research. The Need for an Endowed American Hydraulic Laboratory, Clemens Herschel. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1239-1241. In paper on "An Improved Form of Weir for Gaging in Open Channels," presented by writer before The American Society of Mechanical Engineers, he gave illustrations of need of better hydraulic testing facilities and presented arguments for a great hydraulic laboratory. He makes further comments in present paper.

[See also LIQUIDS, Two-Dimensional Flow; WATER HAMMER.]

HYDROCARBONS

Benzene Series. The Relation Between Constitution and Physical Properties of Hydrocarbons of the Benzene Series (Ueber Beziehungen zwischen Konstitution und physikalischen Eigenschaften von Kohlenwasserstoffen der Benzolreihe), K. v. Auwers. Annalen der Chemie, vol. 419, no. 1, Aug. 12, 1919, pp. 92-120. Comparison of the 24 hydrocarbons presented in table is said to indicate that most important result of investigation is the special grouping of the compounds under conditions mentioned. Details of experiments are given.

Chemical Study. Contributions to the Chemistry of Hydrocarbons (Beiträge zur Chemie der Kohlenwasserstoffe), Jenö Tausz. Zeitschrift für angewandte Chemie, vol. 32, no. 92, Nov. 18, 1919, pp. 361-363. Discusses analogy between mineral-oil and coal-tar xylene. From experiments at the Chem. Inst. of the Tech. High School at Karlsruhe.

HYDROCHLORIC ACID

Production. The Production of Hydrochloric Acid from Chlorine and Water, H. D. Gibbs. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 538-541, 3 figs. It is shown from results of experiments that reaction between chlorine, water, and charcoal between zero and about 130 deg. cent., produces hydrogen chloride and carbon dioxide, and that most important factors influencing speed of reaction are character of charcoal, temperature, and relation between concentrations of water and chlorine.

HYDRODYNAMICS

Equations. Movement of a Solid in an Indefinite Liquid (Sur le mouvement d'un solide dans un liquide indéfini), G. Kolossoff. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 16, Oct. 20, 1919, pp. 685-687. Cases of integration of general equations of movement.

Equilibrium Figures. Figures of a Rotating Liquid. Order of Sequence of Critical Figures of Bifurcation (Figures d'équilibre d'un liquide en rotation. Ordre de succession des figures critiques de bifurcation), Alex. Véronnet. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 22, May 31, 1920, pp. 1303-1305. Generalization of theorem establishing that first ellipsoid of bifurcation found upon curve of MacLaurin's ellipsoids, produces branch of Jacobi's ellipsoids.

Turbulence. See TURBULENCE, Theory.

HYDROELECTRIC DEVELOPMENTS

Nipigon River, Canada. Nipigon River Power Development. Can. Engr., vol. 38, no. 22, May 27, 1920, pp. 502-505, 5 figs. Notes on hydraulic and electrical layout and construction plant. Transmission line will consist of a single three-phase circuit, conductor being of no. 4/0 steel-reinforced aluminum, and will be about 67 mi. in length. Abstract from recent issue of Bul. of Hydro-Electric Power Commission of Ontario.

Queenston-Chippawa. Design of Queenston-Chippawa Power Canal, T. H. Hogg. Can. Engr., vol. 39, no. 13, Sept. 16, 1920, pp. 354-356, 8 figs. Design of canal.

Progress on Queenston-Chippawa Power Canal. Can. Engr., vol. 39, no. 13, Sept. 16, 1920, pp. 347-352, 12 figs. Complete development is to total half million horsepower. Seven million cubic yards of excavation has been completed.

U. S., Data on. Development of National Water-Power Resources—II. Elec. Rev. (Chicago), vol. 76, no. 25, June 19, 1920, pp. 1009-1014, 3 figs. Discussion and compilation of data presented in report of Water-Power Development Committee of Nat. Elec. Light Assn. at its recent convention.

HYDROELECTRIC ENGINEERING

Modern Trend. The Modern Trend of Hydro-Electric Engineering, W. M. White. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 651-653, 3 figs. Reasons are suggested for tendencies toward use of fewer and larger machines of vertical design, higher efficiencies and individual pipe lines.

HYDROELECTRIC PLANTS

Austria. The Energy Supply for Austrian Standard-Gage Electric Railways (Zur Frage der Energieversorgung elektrisch betriebener Vollbahnen), Paul Dittes. Elektrotechnik und Maschinenbau, vol. 37, nos. 29 and 30, July 20 and 27, 1919, pp. 317-321 and 329-336, 18 figs. It is pointed out that the electric power required must in future be obtained principally from hydroelectric plants, as is the case in other non-coal-producing countries. Notes on power stations for exclusive use of railways and power stations for railways and general light and power supply.

Automatic Stations. Automatic Hydro-Electric Stations, T. A. E. Belt. Elec. World, vol. 75, no. 15, Apr. 10, 1920, pp. 827-830, 6 figs. Performance of plant of Iowa Railway & Light Co. of Cedar Rapids, Iowa, and of plant of Ontario Power Co. of Cal. are said to attest reliability of automatic devices.

Development of Automatic Hydro-Electric Generating Stations, T. A. E. Belt. Elec. World, vol. 75, no. 9, Feb. 28, 1920, pp. 477-479, 4 figs. Successful operation of plant installed by Iowa Railway & Light Co. at Cedar Rapids, Iowa, is quoted as establishing prac-

ticability of automatically operating hydroelectric generating stations. Wiring schemes for remote control and automatic hydroelectric plant are illustrated.

California. High Sierras Hydro-Electric Developments. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 513-515, 2 figs. Generating stations with total of 850,000 kw. which will produce 4,000,000,000 kw.-hr. per annum are included in 1920 to 1930 construction programs of Southern California Edison Co. and San Joaquin Light & Power Corp. of California.

New Hydroelectric Plant in Operation, Charles W. Geiger. Power Plant Eng., vol. 24, no. 19, Oct. 1, 1920, pp. 932-933, 2 figs. Kerckhoff hydroelectric project of San Joaquin Light and Power Corporation. Plant which has maximum capacity of 50,000 hp. was constructed at cost of over $5,000,000 and is said to be the only project of its kind begun, finally completed, and placed in operation since signing of armistice.

Progress of Power Industry in Far West, Frank G. Baum. Elec. World, vol. 75, no. 21, May 22, 1920, pp. 1189-1195, 11 figs. Location and storage characteristics of undeveloped primary water-power sites in California totaling 3000 hp. Plans for future development of these sites, covering engineering features and need of favorable legislation.

Canada. See Drummondville, Que.; Niagara Falls; Ontario, Can.; Queenston-Chippawa Development; Quebec; Squamish, Can.

Chile. New Hydroelectric Power Plant at Rio Pangal, Chile, Hugh L. Cooper. Elec. Rev. (Chicago), vol. 75, no. 21, Nov. 22, 1919, pp. 853-856, 6 figs.; also in Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 29-32, 6 figs. Construction features of diversion dam, seven-mile pipe line, penstocks and waterwheels for new plant built by Braden Copper Co. to supply power to its works at Sewell, Chile. Plant capacity will be 20,000 kv-a. available at low-tension busbars of generating station.

Construction Work. Duties of a Young Engineer on the Construction of a Hydro-Electric Plant, H. S. Slocum. Can. Engr., vol. 38, no. 16, April 15, 1920, pp. 375-384, 29 figs. As examples of method of organizing work for construction of hydroelectric project, operations undertaken in construction of plant of Cedar Rapids Mfg. & Power Co. and Appalachian Power Co. are outlined.

Dalmatia. The 100,000-Hp. Hydraulic Plant Gubavica near Duare, Dalmatia (Die 100,000-PS-Wasserkraftanlage Gubavica bei Duare, Dalmatien), P. Zigerli. Schweizerische Bauzeitung, vol. 76, nos. 3 and 4, July 17 and 24, 1920, pp. 23-26 and 35-39, 16 figs. Details of headwater canal, supply conduit, reservoir, pressure mains, machine house, long-distance line, construction costs and other data.

Drummondville, Quebec. Hydro-Electric Plant at Drummondville, P. Q. Contract Rec., vol. 34, no. 5, Feb. 4, 1920, pp. 107-111, 7 figs. Plant comprises 7000-hp. development with provision for expansion to ultimate capacity of 18,000 hp.

Economic Output. On Certain Problems of Optimum Economic Output which Arise in Construction and Operation of Hydroelectric Plants (Sur certains problèmes de rendement économique optimum qui se posent dans la construction et l'exploitation des usines hydro-électriques), A. Auric. Technique Moderne, vol. 12, no. 6, June 1920, pp. 241-243. Economic aspect of installing hydroelectric plant in a given place under given conditions.

Efficient Operation. Effecting Efficient Operating Methods in Hydro-Electric Plants, L. W. Wyss. Power, vol. 52, no. 6, Aug. 10, 1920, pp. 217-219, 1 fig. Gives result of long experiences in number of different hydroelectric stations located in various parts of country. Notes on use of storage reservoir, avoiding high tail water; removing hazard of carrying full head in winter; preventing troubles; use of governor load limiting device, etc.

Flooded, Drying Out. Putting a Flooded Power Station Back into Commission. Elec. Rec., vol. 26, no. 4, Oct. 1919, pp. 197-199, 6 figs. Methods used in drying out and testing electric equipment of 4000-kw. generating station which was flooded by bursting of hydraulic turbine.

France. Developing Hydroelectric Steelmaking. Iron Trade Rev., vol. 66, no. 2, Jan. 8, 1920, pp. 151-152, 1 fig. It is stated that hydraulic power of French Alps represents today 6,270,000 tons of coal, of which metallurgical operations absorb 303,000 hp. and chemical industry 255,000.

From Draft Tubes to Penstock (Installation hydroelectric par eau récupérée), Francis Babey. Electricien, vol. 51, no. 1257, Aug. 1, 1920, 10 figs. Two hydroelectric plants, at Livet and Vernes, France, successively utilize power in same water course. Article describes lower installation where 7000 hp. are developed.

Hydroelectric Installations of the Allevard Forges (Les installations hydroélectriques des forges d'Allevard), A. Garcin and J. Delestrade. Revue générale de l'Électricité, vol. 8, no. 12, Sept. 18, 1920, pp. 375-390, 35 figs. Installations for supplying energy to electric furnaces and light and power to Blast Furnaces and Forges of Allevard, in the French Alps.

Hydro-Electric Plants of French System, Lucien A. H. Pahin. Elec. World, vol. 75, no. 25, June 19, 1920, pp. 1411-1413, 4 figs. Two stations, one supplying 15,000 kw. and another supplying 26,000 kw., were rushed to completion for war purposes. Five power stations will be ultimately developed. Power is employed for operating electrified section of Midi Ry. across Pyrenees Mountains between France and Spain.

Navigation and Harnessing of the Rhine (Le Rhin aux points de vue de la navigation et des forces hydrauliques), B. Seitre. Vie Technique & Industrielle, vol. 1, no. 6, Mar. 1920, pp. 457-462, 4 figs. Hydroelectric installation projected near Mulhouse.

Some Modern Turbine Plants (Einige moderne Turbinen-Anlagen), A. Huguenin. Schweizerische Bauzeitung, vol. 74, no. 26, Dec. 27, 1919, pp. 311-314, 11 figs. Description of power plant in the French Pyrenees, planned and constructed during war, illustrating how lack of good building material during war affected construction work.

The Harnessing of the Dordogne River and the Electrification of the Orleans Railway (L'aménagement hydraulique du bassin de la Dordogne et l'électrification du réseau de la compagnie du chemin de der d'Orléans), G. Tochon. Génie Civil, vol. 77, no. 9, Aug. 28, 1920, pp. 170-172, 1 fig. Details of project.

The Hydroelectric Installation at Tencin (L'installation hydroélectrique de Tencin), Pierre Guieu and Francis Babey. Électricien, vol. 35, no. 1254, June 15, 1920, pp. 241-244, 5 figs. Head is 287 meters and maximum utilizable flow is 1000 liters per second.

The Hydroelectric Plant at Vernes, near Livet, Isère, France (L'usine hydro-électrique des Vernes, a Livet (Isère)), Auguste Pawlowski. Génie Civil, vol. 76, no. 15, Apr. 10, 1920, pp. 345-349, 9 figs. Plant comprises two turbines, each operating a single-phase 5000-volt 3000-kva. alternator at speed of 375 r.p.m.

The Hydroelectric Plant at Eget and Its 120,000-Volt Installation (L'usine hydroélectrique d'Eget et ses installations à 120,000 volts), Denis Eydoux and Paul Leboucher. Revue générale de l'Électricité, vol. 8, nos. 2, 3, 4 and 5, July 10, 17, 24 and 31, 1920, pp.

37-45, 75-86, 103-108 and 145-151, 50 figs. Plant comprises seven 5000-hp. turbo-generators. Height of waterfall is 2475 ft. Turbines are of horizontal Pelton type. Details of transmission line. Records of tests of turbines and alternators.

Germany. Some Modern Turbine Plants (Einige moderne Turbinen-Anlagen). Schweizerische Bauzeitung, vol. 74, no. 22, Nov. 29, 1919, pp. 265-268, 13 figs. Details of main power stations at Hanau.

India. Sindh Hydro-Electric and Irrigation Project, Gwalior. Indian Eng., vol. 68, nos. 3 and 7, July 17 and Aug. 14, 1920, pp. 38-39 and 95-97, 4 figs. July 17: Details of dam, electric installation, etc. A diagram included comparing profiles of seven highest dams of the world. Aug. 14: Notes on financing of project.

Industrial Uses. Hydro-Electric Power and Its Use for Industrial Purposes, Eric A. Lof. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 942-946, 4 figs. It is urged that development of our water power resources be encouraged by enactment of just laws governing their use and construction of large economical supplementary steam plants at "strategic" points.

Interconnection of. Interconnection in Southern Vermont. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 9-12. Records of savings in fuel and water by interconnection of hydroelectric sources in southern Vermont.

Italy. Hydroelectric Plant at Quincineto, Italy (L'impianto idroelettrico di Quincineto sulla Dora Baltea). Industria, vol. 34, no. 14, July 31, 1920, pp. 364-366, 5 figs. Fall is 33 ft. and power obtainable 5056 hp.

Keokuk, Ia. The Hydro-Electric Plant at Keokuk, Ia. Power House, vol. 12, no. 19, Nov. 20, 1919, pp. 509-510, 4 figs. Capacity is 150,000 hp. Dam, power house, lock, dry dock, sea-wall and ice fender are all one concrete monolith, with total linear measurement of 13,185 ft.

Korea. Construction of Suribong Power Project in Korea, O. W. Peterson. Jl. of Electricity, vol. 44, no. 12, June 15, 1920, pp. 595-598, 6 figs. Over-pour masonry diversion dam of heavy gravity type, 650 ft. long and 34 ft. high, with foundations extending 15 ft. below low water level of Kuran River, and diversion tunnel 12 ft. x 12 ft. in section and 955 ft. long, are principal features of development.

Michigan Mine Plants. Mining with Hydroelectric Power. Iron Trade Rev., vol. 66, no. 4, Jan. 22, 1920, pp. 280-283, 14 figs. Iron ore operators in Northern Michigan are said to be making extensive improvements to employ natural resources of peninsula. Description and illustrations of McClure power plant and other plants.

Muscle Shoals. Hydroelectric Development at Muscle Shoals, William B. West. Elec. Rev. (Chicago), vol. 76, no. 23, June 5, 1920, pp. 929-932, 7 figs. Description of water-power plant and dam across Tennessee River built to provide power for nitrate manufacture and auxiliary steam plant to carry load during low-water season.

Niagara Falls. Building the American Niagara Power Extension, O. D. Dales and G. W. Hewitt. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 694-701, 10 figs. Details of dredging, tunneling and erection operations on war-time 100,000-hp. addition to hydroelectric plant of Niagara Falls Power Co.

Construction Progress on Canadian Niagara Power Project. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 1010-1012, 7 figs. Excavation under way on Queenston-Chippawa Canal which will develop most of head between two great lakes.

Developing an Additional 100,000 Horsepower at Niagara, John L. Harper, O. D. Dales and Louis S. Bernstein. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 582-588, 12 figs. Details of hydraulic and structural design and description of new water-power plant on American side of Falls.

Developing Niagara Falls Without Marring Its Beauty, J. G. Warren. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 329-331. Seven months of utilizing additional diversion of 20,000 sec-ft., showing comparative costs. 573,000 hp. to 787,000 hp. can be developed under these plans. Submerged weirs are proposed.

New Hydroelectric Developments at Niagara. Engineer, vol. 128, no. 3331 and 3332, Oct. 31 and Nov. 7, 1919, pp. 427-429 and 454-455, 7 figs. Concerning plant operating under head of 305 ft. and developing 300,000 hp. with provision for eventual increase to nearly 1,000,000 hp.

Niagara Development Breaks Efficiency Records. Can. Engr., vol. 39, no. 12, Sept. 16, 1920, pp. 337-346, 14 figs. Symposium. New plant consists of three vertical units, each of 37,500 hp. maximum rating. Average overall efficiency of all three units, including all losses from forebay to switchboard, is 90 per cent when each generator is delivering approximately 24,000 kw.

Niagara Falls 100,000-Hp. Development, John L. Harper, George R. Shepard, N. R. Gibson and L. S. Bernstein. Elec. World, vol. 76, no. 12, Sept. 18, 1920, pp. 561-568, 11 figs. General engineering problems involved in development. Hydraulic design and efficiency of units and plant. Effect of loading on construction of substructures.

Queenston-Chippawa Development at Niagara Falls, Ontario, Harry Gardiner. Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 17-21, 11 figs. Canal project, to cost about $25,000,000, consisting of one of possible group of several parallel canals near Niagara Falls, each canal intended to develop 300,000 hp.

Recent Developments in Utilization of Niagara Falls (Les récents développements de l'utilisation des chutes du Niagara), P. Wahlman. Génie Civil, vol. 76, no. 26, June 26, 1920, pp. 565-570, 18 figs. Plant of 300,000 hp. recently constructed by hydroelectric power commission at Queenston, Canada. Paper read before Svenska Vattenkraftsföreningen, Stockholm.

The Relation of the Chemical Industry of Niagara Falls to the Water Works, John A. Kienle. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 496-513 and (discussion) pp. 514-517, 7 figs. Statistics of power development and of electrically made products, notably manufacture of liquid chlorine and bleaching powder by electrolytic method.

World's Largest Hydro-Electric Units, F. A. Annett. Power, vol. 52, no. 11, Sept. 14, 1920, pp. 412-422, 25 figs. Details of three 37,500-hp. hydroelectric units installed by Niagara Falls Power Co., each of which has carried over 40,000-hp. load; more than 90 per cent of total energy in water is delivered at generator terminals; load on thrust bearings approximately 500,000 lb., with only a 26-hp. friction loss. Project cost approximately $8,000,000.

Norway. Hydroelectric Installations in Norway, Chas. H. Tallant. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 417-418, 3 figs. Notably installation of electrolytic furnace plant where seven 4500-hp. Pelton impulse turbines, direct connected to 10,000-amperes, 300-volt direct-current generators.

Ontario, Can. Hydro-Electric Power Development at High Falls. Can. Engr., vol. 37, no. 20, Nov. 13, 1919, pp. 451-454, 15 figs. Net head of 80 ft. utilized at power site on Miss. River by Hydro-Electric Power Commission of Ontario.

Details of dam, intake, gate house, pipe line and power house. Surface area method of proportioning materials said to show excellent results in construction of concrete dam.

The Central Ontario System of Hydro-Electric Power, G. B. Smith. Jl. Eng. Inst. of Canada, vol. 3, no. 6, June 1920, pp. 289-292, 1 fig. System comprises seven power houses operating in parallel and feeding into a system of 370 miles of 44,000-volt transmission lines.

Outdoor Installation. The Outdoor Generating Station, H. W. Buck. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 194-197, 2 figs. Drawings are shown of hydroelectric plant which was designed and submitted to War Department for development at Muscle Shoals, Ala. It is argued that a plant of this kind is entirely feasible and offers decided advantages from standpoint of economy and construction.

Panama Canal. Hydro-Electric Power Plant of the Panama Canal. Engineer, vol. 128, no. 3336, Dec. 5, 1919, pp. 562-563, 9 figs., partly on supp. plate. Notes on raising of generated voltage at Gatun station from 2200 to 6600 without interruptions in service.

Pond-Level Control. Pond-Level Control for Hydro Plants, Earl Stafford. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 663-665. Comparative study of devices used to regulate pond levels and provide discharge capacity for floods.

Quebec. Hydro-Electric Development at St. Jerome, Que., L. A. Wright. Can. Engr., vol. 38, no. 12, Mar. 18, 1920, pp. 299-302, 7 figs. Concrete dam, with 190-ft. spillway, carries railway siding. Shaft of hydraulic turbine is direct connected to generator and also drives main power shaft of factory by means of speed-reducing silent chain.

Queenston-Chippawa Development. Electrical Features—Queenston-Chippawa Development, E. T. J. Brandon. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, p. 445. Vertical shaft generators of 45,000 kva. capacity operating at 12,000 volts, 25 cycles, 187½ r.p.m., with thrust bearings designed to carry load of about 100,000,000 lb.

Hydraulic Installation of the Queenston-Chippawa Development, M. V. Sauer. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 440-444, 5 figs. Features described are canal control gate, ice chutes, screens, removable gates, penstocks, Johnson valves, turbines, governor system, control pedestals and service units.

The Design of the Queenston-Chippawa Power Canal, T. H. Hogg. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 435-439, 6 figs. General description of economics and hydraulics of canal, together with details of methods of design.

The General and Economic Features of the Queenston-Chippawa Development, H. G. Acres. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 446-452, 9 figs. Development of plant designed with aggregate of 500,000 hp. capacity.

See also Niagara Falls.

Ranney's Falls, Can. Hydro-Electric Development at Ranney's Falls. Can. Engr., vol. 38, no. 20, May 13, 1920, pp. 457-459, 6 figs. Description of two 5000-hp. units to operate under 47-ft. net head between upper and lower reaches at Trent canal near Campbellford.

Regulating Prime Movers. Regulating Hydro-Electric Prime Movers, C. F. Mosher. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 280-281. Ability to hold constant speed, inherent regulation and momentary changes of speed are discussed in detail. Conditions upon which speed changes are based. From paper read before System Operators of New England.

Regulation of Water Output. High-Head Hydro-electric Plants (Les usines hydroélectriques de haute chute), Denis Eydoux. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs civils de France, nos. 10-12, Oct.-Dec. 1919, pp. 439-466, 11 figs. Regulation of water output throughout the year. Scheme of interconnection of high-head and low-head plants is visualized, in which high-head plants regulate energy produced by combination.

Rhone-Rhine Possibilities. The Swiss Rhone-Rhine Navigation, A. Wharton Metcalfe. Engr., vol. 129, no. 3355, April 16, 1920, pp. 389-390, 2 figs. Hydroelectric aspect. Water power and generating stations.

River-Flow Measurements. Measuring River Flow for Hydro-Electric Plant Operation, R. D. De-Wolf. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 361-363, 4 figs. Chart for estimating pond capacity, river flow, and period that given load can be carried with pond at given level.

Rumford Falls, Me. The Rumford Falls Hydro-electric Plant. Power, vol. 50, no. 19, Nov. 11-18, 1919, pp. 680-690, 8 figs. Ultimate capacity will be 40,000 kw. in five vertical units of 8000 kw. each.

Scandinavian. Power Developments in Scandinavia, J. W. Beckman. Gen. Meeting Electrochemical Soc., April 8-10, 1920, no. 29, pp. 403-409. Résumé of developments of water power for various purposes in Norway and Sweden, showing chronological rise of this development and its cost and the cost of power in those countries. It is estimated that Norway has potential water power of 7,500,000 hp., or 3020 hp. per 1000 inhabitants; Sweden, 6,200,000 hp. or 1050 hp. per 1000; and United States, 67,000,000 hp. or 540 hp. per 1000.

Semi-Portable Machine Shelters. An Alternative for Outdoor Generators, Henry G. Reist. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 360-361. Reference is made to article on Outdoor Generators published in Gen. Elec. Rev., March 1920. It is suggested that in order to overcome difficulties there envisaged arising from sluggishness developed by lubricating oils in cold weather, standard generators be used and housed under inexpensive semi-portable shelters.

Silt Disposal. Silt Disposal at Tacoma Hydro-Electric Plant, Llewellyn Evans. Power, vol. 51, no. 18, May 4, 1920, pp. 694-697, 6 figs. Development consists of 50-ft. concrete dam diverting water across bend in river with 10,000-ft. tunnel.

Southern U. S. Power Development in the Southern States, George K. Miltenberger, Lyle A. Whitsit and Robert W. Lamar. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 769-771, 2 figs. Report of power section of war industries board reviews electric power resources of southern states at close of World's War and makes recommendations for efficient development to accommodate estimated demands of future.

Squamish, Can. Squamish Hydro-Electric Power and Water Supply Development, J. B. Holdcroft. Elec. News, vol. 29, no. 5, March 1, 1920, pp. 36-39, 3 figs. Plant produces 500 hp.

Sweden. Hydroelectric Plants in Sweden (Elektrotekniken under Ar 1919), Teknisk Tidskrift (Elektroteknik), vol. 50, no. 6, June 2, 1920, pp. 97-99. Statistics of construction of new installations and extensions to old plants during 1919.

See also Scandinavian.

Switzerland. The Navigation and the Harnessing of the Rhine (Le Rhin aux points de vue de la navigation et des forces hydrauliques). Vie Technique & Industrielle, vol. 1, no. 5, Feb. 1920, pp. 357-363, 14 figs. Hydroelectric power

plant under construction at Eglisan where it is expected maximum power of 24,000 hp. will be developed.

The Water-Power Plant "Gosgen" on the Aare River (Die Wasserkraftanlage "Gosgen" an der Aare der A.-G. Electrizitätswerk Olten-Aarburg). Schweizerische Bauzeitung, vol. 75, nos. 9, 10, 11, 17, 18, 19, 23, 24 and 26, Feb. 28, Mar. 6 and 13, Apr. 24, May 1 and 8, June 5, 12 and 26, 1920, pp. 93-96, 110-113, 124-125, 188-190, 199-201, 209-210, 249-254, 263-266 and 286-289, 76 figs. Description of head- and tail-water canals, power house, with details of turbine installation, generators and exciters, transformers and water supply of the plant.

See also Rhone-Rhine Possibilities.

United Kingdom. Hydro-Electric Power Works at the Great Lake, Tasmania. Engr., vol. 130, nos. 3366 and 3367, July 2 and 9, 1920, pp. 3-5 and 40-41, 13 figs., 4 on 2 supp. plates. Describes water power scheme of Government of Tasmania, with particular reference to recent additions to equipment of Great Lake station. New turbines are said to be largest and most powerful ever built in United Kingdom and the pipe lines the largest welded steel pipe lines ever manufactured in the country.

[See also PAPER MILLS, Ocean Falls, B. C.; WATER POWER.]

HYDROGEN

Electrolytic Production. Electrolytic Production of Hydrogen and Oxygen. Engineering, vol. 108, no. 2807, Oct. 17, 1919, pp. 512-514, 14 figs. Describes electrolyzers of Integral Oxygen Co., made up of various cells, each of which is a self-arranged two-electrode unit and fitted with special arrangement for regulation of gas pressure.

Electrolytic Production of Hydrogen and Oxygen by the British Armies (La production de l'hydrogène et de l'oxygéne par électrolyse aux armées britanniques), T.-A. Ross. Revue générale de l'Electricité, vol. 7, no. 24, June 12, 1920, pp. 795-801, 10 figs. Details of installation near Rouen.

Electrolytic Production of Hydrogen, Harry L. Barnitz. Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 201-206, 8 figs. Theoretical principles involved in calculation of cell efficiency are outlined and various types of electrolytic cells for commercial production of hydrogen and oxygen are described.

The Production of Hydrogen and Oxygen by Electrolysis, T. A. Ross. Elec. Rev. (Lond.), vol. 86, no. 2197, Jan. 2, 1920, pp. 4-8, 12 figs. Plant erected in battlefield of France.

Generation from CO and Calcium Oxide. Generating Hydrogen from Carbon Monoxide and Hydrate of Lime and the Acceleration of Water-Gas Reaction by Means of Iron (Ueber die Wasserstoffgewinnung aus Kohlenoxyd und Kalkhydrat und die Beschleunigung der Wassergasreaktion durch Eisen), Henry Engels. Journal für Gasbeleuchtung, vol. 62, nos. 34 and 35, Aug. 23, and 30, 1919, pp. 477-483 and 493-500, 4 figs. Acceleration of reaction of carbon monoxide with calcium oxide by means of iron oxide and determination of water-gas balance between 400-900 deg. cent.

Generation of. The Generation of Hydrogen by the Reaction Between Ferrosilicon and a Solution of Sodium Hydroxide, E. R. Weaver. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 232-240, 16 figs. Work done upon determination of best conditions for operation of hydrogen generator using ferrosilicon and solution of sodium hydroxide is presented as example of unusual method of studying complicated industrial process.

Interaction with Chlorine. See CHLORINE, Interaction with Hydrogen.

Magnetic Susceptibility of. On the Magnetic Susceptibilities of Hydrogen and Some Other Gases, Také Soné. Sci. Reports Tôhoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 115-167, 12 figs. partly on supp. plate. Account of relative measurement of susceptibility of gases in which susceptibility of pure water was taken at 0.720×10^{-6}.

See also GASES, Magnetic Susceptibility of.

Occlusion of. The Influence of Hydrogen Sulphide on the Occlusion of Hydrogen by Palladium, Edward Bradford Maxted. Jl. Chem. Soc., vols. 115 and 116, no. 683, Sept. 1919, pp. 1050-1055, 1 fig. Hydrogen-occluding power of oxygen-free palladium-black was measured before and after treatment with hydrogen sulphide. Data are presented relating to absorption of hydrogen sulphide by palladium and stability of absorption compound.

Ozone Form of. The Ozone Form of Hydrogen, Gerald L. Wendt. Proc. Nat. Academy of Sciences, vol. 5, no. 11, Nov. 1919, pp. 518-521. Evidence said to establish existence of form of hydrogen which bears same relation to ordinary hydrogen that ozone bears to oxygen.

Secondary Spectrum of. On the Secondary Spectrum of Hydrogen, T. R. Merton. Proc. Roy. Soc., vol. A 96, no. A 679, Jan. 2, 1920, pp. 382-388, 4 figs. on 2 supp. plates. Attempt to resolve spectrum into groups of lines which showed similar behavior under different physical conditions.

Triatomic. Triatomic Hydrogen, Gerald L. Wendt and Robert S. Landauer. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 930-946, 7 figs. Reactive modification of hydrogen was produced in experiments by several methods—by X rays from radium emanation, by electrical discharge under reduced pressure and by high potential corona at atmospheric pressure. Attempts to produce activation by Schumann light rays failed. This active hydrogen was found to reduce sulphur, arsenic, phosphorus, mercury, nitrogen, and both acid and neutral permanganate.

Viscosity of. See VISCOSITY, Gases.

HYDROGEN PEROXIDE

Electrolytic Production of. Electrolytic Production of Hydrogen Peroxide, F. W. Skirrow and E. R. Stein. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 10, pp. 69-79, 1 fig. Literature is briefly abstracted, followed by results of experimental decomposition of sulphuric acid, sodium or potassium acid sulphate solutions. Current efficiencies with which persulphuric acid was formed were about the same in all three solutions. Platinum was only successful anode material.

HYDROLYSIS

Metal Acetates. Investigation of Hydrolysis of Some Metal Acetates (Untersuchung über die Hydrolyse Metallacetate), N. Löfman. Zeitschrift für einiger anorganische und allgemeine Chemie, vol. 107, no. 4, July 29, 1919, pp. 241-264, 1 fig. Special tests of distribution coefficient and its dependency on temperature and concentration. Acetates examined were ammonia, aluminum, iron, mercury, silver, nickel, cobalt, zinc, lead, magnesium and natrium acetate.

HYDROMONOPLANES

See FLYING BOATS, Schalk Hydromonoplane.

HYDROPLANES

Hangars. See HANGARS.

HYGIENE

Employment and. See CITIES.

HYSTERESIS

Losses Due to. Separation of Hysteresis Losses and Losses Due to Foucault Currents in Metal Sheets Employed in Electric Machines (Séparation des pertes par hytérésis des pertes par courants de Foucault dans les tôles destinées à la construction de machines électriques), A. Joitel. Revue générale de l'Électricité, vol. 7, no. 5, Jan. 31, 1920, pp. 148-155, 4 figs. Formulæ are given and graphs are constructed for determining part of total loss due to hysteresis and that due to Foucault currents.

Measurement of. Measurement of Hysteresis Values from High Magnetizing Forces, W. L. Cheney. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 383, June 19, 1920, pp. 281-289, 3 figs. Apparatus for measuring hysteresis by a modification of "isthmus method." Graphs showing coercive force and residual induction from successively higher maximum magnetizing forces plotted against latter as independent variable up to field of $H = 2500$ gausses.

I

ICE

Transportation of. Transportation of Ice, Nat Duke. Ice & Refrigeration, vol. 57, no. 5, Nov. 1919, pp. 200-201. Difficulties encountered last summer by Railroad Administration in transporting ice for conservation of food, particularly into New York City. Paper read before Natural Ice Assn. of Am.

ICE MANUFACTURE

Cost Accounting. Cost Accounting, George L. Bennett. Ice & Refrigeration, vol. 57, no. 5, Nov. 1919, pp. 194-197. Advises systematizing cost data in ice-making industry. Paper read before Natural Ice Assn. of Am.

ICE PLANTS

Absorption. Low-Pressure Absorption Ice Plant, C. M. Vaden. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 290-291. Discussion of conditions which effect economy of plant.

Atlanta, Ga. Three-Hundred-Ton Ice and Cold Storage Plant. Southern Engr., vol. 34, no. 1, Sept. 1920, pp. 58-66, 15 figs. Plant is steam driven and includes four Vilter ammonia compressors, generating units for lighting and power purposes, auxiliaries, and boiler plant rated at upwards of 1000 hp.

Economical Operation. Economy at the Finney Avenue Ice Plant, St. Louis, C. Wilkie. Power, vol. 51, no. 25, June 22, 1920, pp. 990-994, 12 figs. Plant 14 years old, with mediocre equipment, is said to be operating at 58.6 per cent over its rated capacity and to be delivering average of 8.5 tons of ice per ton of 10,000-B.t.u. coal. Such performance is attributed to ingenuity of management, coöperation of operating force and careful manipulation of equipment.

Electric Operation. Operating an Ice Plant, C. E. Rose. Refrigerating World, vol. 55, no. 3, Mar. 1920, pp. 13-16, 2 figs. Substitution of electric motors for oil engines at plant of Arkansas Cold Storage Co., Little Rock, Ark., is said to have resulted in decrease of operating cost.

Freezing Tanks. Constructing a Concrete Freezing Tank, W. A. Darter. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 665-666, 2 figs. Method of utilizing old steel tanks as forms in making new concrete tanks.

Freezing Tanks, Fred Ophuls. Ice & Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 258-260; also Refrigeration, vol. 26, no. 6, Jan. 1920, pp. 34-37. Commercial, engineering and practical points of view of freezing tank design.

Flooded System. See REFRIGERATING PLANTS, Flooded System of Ammonia Evaporation.

Labor Saving in. Saving Labor Costs, Van R. H. Greene. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 251-252. Examples of labor saving in ice tank room, daily ice storage room, and engine and boiler rooms of refrigerating plant.

Management. Men and Machinery in the Ice Plant, Erle S. Ormsby. Am. Soc. Refrigerating Engrs., vol. 6, no. 2, Sept. 1919, pp. 103-107. Instances are related where, it is said, introduction of modern methods and organization by modern methods improved efficiency and increased output of plant.

Motor-Driven. Electrically Driven Raw Water Ice Plants, A. M. Jones. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 260-261. Reasons for tendency to introduce electric drive.

Raw-Water. World's Largest Raw-Water Plant, A. Crawford Craig. Refrigerating World, vol. 55, no. 10, Oct. 1920, pp. 14-18, 13 figs. Commonwealth Ice Company's West End Avenue Plant, New York, has capacity of eight hundred tons of ice per day. All machinery operated by direct connected motors.

Raw-Water vs. Distilled-Water. Raw Water vs. Distilled Water Ice Plants—Steam to Electricity, A. H. Hutchinson. Refrigeration, vol. 26, no. 1, Feb. 1920, pp. 36-38. Writer concludes that, on the whole, the raw-water plant is most surely the plant of the future. Paper prepared for convention of Southern Ice Exchange.

Shutting Down. Shutting Down the Ice Plant, A. G. Solomon. Power Plant Eng., vol. 24, no. 19, Oct. 1, 1920, pp. 946-948. Precautions to be taken and procedures to be followed in preparation for idle season.

Storage Capacity. Determining Advantageous Ice Storage Capacity, F. E. Matthews. Am. Soc. Refrig. Engrs. Jl., vol. 6, no. 3, Nov. 1919, pp. 196-200, 2 figs.; also Ice & Refrigeration, vol. 58, no. 21, Feb. 1920, pp. 96-98, 2 figs. Construction of graph representing storage and sale for entire year. Paper read before Eastern Ice Manufacturers' Assn.

ICE STORAGE

Houses for. Ice Storage House Construction and Operation, John R. Livezey. Ice & Refrig., vol. 58, no. 5, May 1920, pp. 272-273. Survey of constructional practices.

Interior Finishes of Ice Storages, Junius H. Stone. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 254-256. Relative values of wood, cement and asphalt as storage house finishes.

IGNITION

Apparatus. See MAGNETOS; SPARK PLUGS.

Circuit Characteristics. Ignition Circuit Characteristics as Determined by Engine Requirements, Harry F. Geist. Automotive Industries, vol. 43, no. 14, Sept. 30, 1920, pp. 666-670, 7 figs. How proportions of primary circuit character-

istics of battery and coil ignition system may be theoretically determined for production of spark of definite energy value for engine of any specified speed and number of cylinders.

Coil Energization. Energization of the Ignition Coil, Harry F. Geist. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 824-828, 5 figs. Calculation of time required for ignition coil to build up to different fractions of its maximum strength. Discussion of energy involved in spark and efficiency of sparking systems under different conditions.

Coils, Energy Distribution in. Energy Distribution Chart for Coils, Harry F. Geist. Automotive Industries, vol. 42, no. 10, Mar. 4, 1920, pp. 610-611, 1 fig. Writer simplifies equations shown in previous article and presents chart which is said to offer simple method of analyzing energy performance of coils regardless of proportion of their characteristics.

Gases. See GASES, Ignition of.

Impulsive-Spark. The Ignition of Gases at Reduced Pressures by Impulsive Electric Sparks, W. M. Thornton. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 40, no. 237, Sept. 1920, pp. 345-356, 6 figs. Ignition by impulsive spark was found in experiments to be on the whole more difficult at low pressures than ignition by hot wires.

Magneto, Advantages of. Advantages of Magneto Ignition, A. D. T. Libby. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 277-287 and (discussion) pp. 287-290, 15 figs. Advantages claimed are that magneto does not depend upon battery and generator for starting and running; that with it safer starting is assured, that it gives more power with less oil and fuel, cooler and smoother running engines and cleaner spark-plugs, and that it does not deteriorate rapidly with age.

Ohmer Apparatus. Ohmer Line Shows Latest Practice in Ignition Apparatus. Automotive Industries, vol. 42, no. 9, Feb. 26, 1920, pp. 552-553, 5 figs. Type A Ohmer with reversible bushing on distributor shaft, which permits use of same distributor gear, rotor and housing for 6-cylinder and 4-cylinder magneto.

Sets. Compact Form of Ignition Set on 1920 Car Models. Automotive Industries, vol. 42, no. 13, March 25, 1920, pp. 754-755, 3 figs. Features possessed by Westinghouse ignition system are said to be self-lubricating cam, compactness, efficiency of coil, breaker contacts requiring little adjustment, and condenser that is claimed to be indestructible.

Spark, Heat Energy of. Heat Energy of Various Ignition Sparks. Nat. Advisory Committee for Aeronautics, report no. 56, 1920, 16 pp., 17 figs. Results of direct measurements in absolute units of total heat supplied to spark gap by ignition systems of different types operating at various speeds under conditions equivalent to those in cylinder of high-compression aviation engine. Values ranging from 0.00015 B.t.u. per spark in more powerful magnetos to 0.00003 B.t.u. in case of battery system are recorded.

Subsidiary Gap. The Subsidiary Gap as a Means for Improving Ignition, W. S. Gorton. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 400-406, 1 fig. Report prepared at Bureau of Standards for National Advisory Committee for Aeronautics. It is concluded that series gap may be used as remedy for considerable part of trouble due to fouling of blocks which is met with in practice.

Temperatures, Determination. The Determination of Ignition Temperatures by the Soap-Bubble Method, Albert Greville White and Tudor Williams Price. Jl. Chem. Soc., vols. 115 and 116, no. 685, Nov. 1919, pp. 1248-1264, 5 figs. Results given by method are said to have been affected by physical state of igniting surface and nature of material by which it was made.

Theory of. The Process of Ignition, A. P. Young and H. Warren. Automobile Engr., vol. 10, no. 136, March 1920, pp. 115-130, 45 figs. Production of mixture, generation of spark, and inception of explosion are discussed in relation to one another. Conclusions arrived at are based on results of experimental investigation carried out by writers.

[See also GASOLINE ENGINES, Ignition; MAGNETOS; SPARK PLUGS.]

ILLUMINATING GAS

See COAL GAS.

ILLUMINATION

Daylight, Factory. Daylight Illumination in the Shops. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 122-126, 6 figs. Illustrates how "daylight factor" can be increased by devoting maximum amount of wall space to glass.

Wall Colors and. Effect of Color of Walls and Ceilings on Resultant Illumination, A. L. Powell. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 209-213, 1 fig. Outline is given of color schemes for walls, ceilings and fixtures that have been found to give good results in industrial plants, offices, schools, stores and residences.

See also LIGHTING.

IMHOFF TANKS

See SEWAGE TREATMENT, Imhoff Tanks.

IMPACT

Hertz's Theory. On Some Applications of Hertz's Theory of Impact, C. V. Raman. Physical Rev., vol. 15, no. 4, Apr. 1920, pp. 277-284, 3 figs. Discusses problem of transverse impact of a solid sphere on an infinitely extended elastic plate of finite thickness, and attempts to calculate theoretical coefficient of restitution which is a function of elastic constants and densities of the materials, diameter of sphere and thickness of plate, and of velocity of impact. Calculation results in simple formula for coefficient of restitution. Series of experiments carried out in author's laboratory by A. Venkatasubbaraman furnished quantitative confirmation of formula within limits of its applicability.

Problem of. Remarks on the Problem of Impact, N. W. Akimoff. Jl. Am. Soc. Naval Engrs., vol. 31, no. 4, Nov. 1919, pp. 849-856, 4 figs. Popular exposition of difference in concepts of force, work and power.

[See also SOLIDS, Impact, Propagation in.]

IMPACT TESTING

Disadvantages. Miscellaneous Notes on Impact Tests, Prof. Akimasa Ono. Memoirs of the College of Eng., Kyushu Imperial University, vol. 2, no. 1, 1920, pp. 89-116, 20 figs. Disadvantages found to be of slight importance.

INCLINOMETER

Induction Type. Determination of Inclination by Means of Induction Inclinometer (Ueber die Bestimmung der Inklination mit dem Induktions—Inklinator), W. Uljanin. Terrestrial Magnetism and Atmospheric Electricity, vol. 24, no. 3, Sept. 1919, pp. 113-117, 1 fig. New method for determining angle of inclination said to be superior to Wild's method, which is most frequently used at present.

INDICATORS

Steam-Engine. High-Speed Indicators, Thomas Midgley, Jr. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 254-257, 11 figs.

Classification and description of various types of steam-engine indicators, particularly type developed at Bur. of Standards.

Steam-Engine, Diagrams of. See STEAM ENGINES, Indicator Diagrams.

INDIUM

Compressibility of. The Compressibility of Indium, Theodore W. Richards and Jitsusaburo Sameshima. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 49-54, 1 fig. Compressibility at 25-deg. C. over range 100-500 megabars was found to be 0.0000027.

INDUCTANCE

Cylindrical Conductors. Mutual Inductance of Two Straight Cylindrical Conductors Which Lie in Parallel Planes but Which Are not Themselves Parallel, Albert M. Jacobs. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 244-245. Formulæ are derived for case of symmetrical arrangement, and it is pointed out how they may be applied in case of unsymmetrical arrangement.

Measurement of. Everyday Measurement of Inductance and Capacity in the Wireless Laboratory, L. B. Turner. Radio Rev., vol. 1, no. 12, Sept. 1920, pp. 585-590, 7 figs. Inductance and capacity bridges designed and constructed at Signals, Experimental Establishment, Woolwich, England.

See also CAPACITY, Measurement of; ELECTRICAL MEASUREMENTS, Inductance and Capacity.

INDUCTANCE COILS

Air-Core. The Design of Air-Core Inductance Coils of Minimum Weight for a Given Inductance and Resistance, C. O. Gibbon. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 660-665, 2 figs. General outline of theory. It is determined that reluctance of total magnetic path is twice that of portion of path through coil, for maximum efficiency coils.

Calculations. Simplified Inductance Calculations, with Special Reference to Thick Coils, Philip R. Coursey. Wireless World, vol. 7, no. 79, Oct. 1919, pp. 380-385, 3 figs. Plots for determining values of various coefficients in formula and thus simplify calculations. Abstract of paper read before Phys. Soc. of Lond.

Dimensions. Dimensions of Inductance Coils, M. K. Akers. Wireless Age, vol. 8, no. 1, Oct. 1920, pp. 20-21, 1 fig. Includes table of inductances taken from chart based on Lorenz's formula.

INDUCTION

Unipolar. Unipolar Induction, W. F. G. Swann. Physical Rev., vol. 15, no. 5, sec. series, May, 1920, pp. 365-398, 4 figs. Consideration of extent to which so-called "moving-line theory" is equivalent of Maxwell-Lorentz theory. Discussion of experimental results heretofore obtained, one of main conclusions reached being that in all experiments where a null effect was obtained, nature of apparatus was such as to shield off any effect which might legitimately have been expected. Electrical field of a uniformly rotating, and uniformly magnetized sphere is calculated and discussed under various conditions.

INDUCTION COILS

Resonance. Electric Resonance in a Coil with an Iron Core (Résonance électrique dans un circuit dont la self-induction contient du fer), P. Boucherot. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 12, March 22, 1920, pp. 725-728, 2 figs. Formula for determining excess voltage resulting from grounding conductor in long cable.

Square-Section. Coefficient of Self-Induction of Coils with Square Winding Cross-Section. Notes on Coils with Superimposed Windings (flat coils). (Ueber den Selbstinduktionskoeffizienten von Spulen mit rechteckigem bzw. quadratischem Windungsquerschnitt. Spulen mit übereinander liegenden Windungen (Flachspulen), A. Esau. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 4, Sept. 1919, pp. 386-394, 2 figs. Formula is derived for self-induction coefficient of flat coils with square cross-section and is compared with formula for parallel windings. Tables and curves are presented which are said to offer a simple and practical method of determining self-induction of such coils. Report from the Laboratory of the Berlin Wireless Telegraphy Co.

Tesla, New Type of. A New Type of Tesla Apparatus (Un neuvo tipo de aparato Tesla), Konrad Simons. Contribución al Estudio de las Ciencias físicas y matematicas, Universidad nacional de la Plata, vol. 1, no. 7, Nov. 1918, pp. 487-496, 6 figs. Modification of Cortwright's apparatus described in Elec. Experimenter, June 1913.

INDUSTRIAL CONDITIONS

England and France. Industrial and Labor Conditions Abroad, Luther D. Burlingame. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1079-1083. Views based on experiences of writer's recent trip to England and France, as member of Nat. Screw Thread Commission, presented with thought that they may serve as guide and warning to both employers and workmen engaged in American industries.

France. French Industrial Conditions, A. L. Valentine. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 409-410. Writer expects that France will shortly get back to stable basis.

INDUSTRIAL DEMOCRACY

Experiences in. Experiences in Industrial Democracy, F. L. Fluerbach. Contract Rec., vol. 33, nos. 45 and 46, Nov. 5 & 12, 1919, pp. 1032-1034, & 1051-1053. Successful application by William Demuth & Co. of a plan of internal government in its plant, aiming to solve labor difficulties.

Industrial Democracy—A Remarkable Experience, B. C. Forbes. Brick & Clay Rec., vol. 55, no. 11, Nov. 18, 1919, pp. 957-960. How Packer Piano Co. of Fort Wayne, Ind., established about six years ago "cordial, friendly, co-operative and mutually profitable relations" between employers and workers, which "have continued unruffled ever since."

INDUSTRIAL FURNACES

See FURNACES, INDUSTRIAL.

INDUSTRIAL MANAGEMENT

Automotive Industry. Decreasing Labor Cost Despite the Prevalent Unrest, Harry Tipper. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1082-1083. Experience of machine shop employing 2500 men which is said to have permitted 53 per cent increase in wages and 25 per cent decrease of labor.

Bibliography. A List of Bibliographies on Industrial Engineering and Management. Soc. Indus. Engrs., vol. 3, no. 6, May 1920, 23 pp. Compiled by Committee on Research of Society of Industrial Engineers.

Brickyards. Adaptability of Various Kinds of Fuel and the Conservation of Labor in Brickyards (Verwendungsmöglichkeit verschiedener Brennstoffe und Arbeitersparnisse im Ziegeleibetriebe), H. Bashant. Ziegelwelt, vol. 50, nos. 63-64 and 65-66, Aug. 16 and 23, 1919, pp. 367-369 and 382-384. Writer deplores lack of

expert knowledge on part of most brickyard managers and owners, and recommends adoption of Taylor System.

Can. Pac. R. R. Graphical Production Control, E. T. Spidy. Eng. Production, vol. 1, no. 7, July 1920, pp. 249-251, 6 figs. Outlines principles which have been adopted by the management of Can. Pacific R. R. in creation of special department called Production Department attached to chief executive of Angus Shops to develop this work, and said to be a distinctly new department for railroad shops. Abstracts from paper read before Can. Ry. Club.

Coal Mines. Taylorism in the Mine, M. Langrogne. Colliery Guardian, vol. 118, nos. 3074, 3076 and 3078, Nov. 28, Dec. 12 and 27, 1919, pp. 1429-1430, 1574 and 1714-1715. Chief requirements for successful application are seen to be unity of control, reinforced technical assistance, and precise definition of working program and means of carrying it out. Paper read before Société de l'Industrie minérale de France.

The Need of Better Management in Mining Operations, Hugh Archibald. Bul. Taylor Soc., vol. 5, no. 2, Apr. 1920, pp. 68-74 and (discussion) pp. 75-78, 1 fig. Experience of introducing industrial management in coal-mining operations.

See also COAL MINES, Management Methods.

Control Boards. Control Board for Truck Production, J. F. Danielson. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 384-387, 9 figs. Suggested board which is divided into as many sections as there are models produced, space allotted to model being dependent upon production requirements.

Progress Planning Boards in Locomotive Repair Work. Ry. Gaz., vol. 31, no. 22, Nov. 28, 1919, pp. 707-708, 1 fig. Methods of forecasting and planning locomotive repair work.

Counsel. Why Industry Seeks Competent Counsel, L. V. Estes. Indus. Management, vol. 59, no. 6, June 1920, pp. 475-480. Significance of competent counsel in improvement and progress of industries.

Department Layouts. Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 3, no. 5, Jan. 29, 1920, pp. 131-134, 3 figs. Concerning layout of departments in new works and machinery in each department.

Emergency Production. Converting a Machine Shop to Emergency Production, Ellsworth Sheldon. Am. Mach., vol. 52, no. 9, Feb. 26, 1920, pp. 431-437, 27 figs. Experience of Schickel Motor Co., Stamford, Conn., which during war turned from manufacture of motorcycles to that of Liberty motor parts, specially valve rocker-arm.

Employees, Arousing Interest in. Making Employees Interested in Their Work, Harry Dexter Kitson. Am. Mach., vol. 52, no. 19, May 6, 1920, pp. 983-985. Psychological principles involved in process of arousing interest of employees.

Engineering Students, Training in. The Training of Engineering Students in Industrial Management, Bruce W. Benedict. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 492-494, 1 fig. How University of Illinois has organized its school shops upon commercial basis. Plan is based upon recognition of fact that "engineer is primarily manager of human enterprises rather than a technician making plans for others to execute."

Fatigue Prevention. See FATIGUE.

Financing. If I Were a Manufacturer Today, Edwin Baxter. Factory, vol. 25, no. 6, Sept. 15, 1920, pp. 861-863. Banker's connection with increased production and economy.

Fixing Responsibility. Arranging Functions to Fix Responsibility, A. Whitehead. Eng., vol. 110, nos. 2849, 2850 and 2851, Aug. 6, 13 and 20, 1920, pp. 172-174, 204-206 and 236-237. Organization of shop with a view to avoiding repetition of work by various persons and establishing definite relationships between different departments.

Foremen. See FOREMEN.

Forms. Preparing Forms and Their Use to Facilitate Management, M. H. Potter. Eng. & Indus. Management, vol. 2, no. 24, Dec. 24, 1919, pp. 750-751. On selection of forms for aiding in handling of orders and shop routine.

Foundries. Standardizing Foundry Operations, Paul R. Ramp. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 29-30. It is observed that definite rules for every operation in foundry, if laid down by proper authority, result in improved production and lower manufacturing costs, and save time and confusion.

See also FOUNDRIES, Organization.

German Engineers and. What Engineers Are Doing in Germany, E. J. Mehren. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 562-565. Work on standardization and progress in industrial management.

Great Britain. Scientific Management in Great Britain, Clarence H. Northcott. Indus. Management, vol. 60, no. 1, July 1920, pp. 57-58. Experience during eight years of firm of Hans Renold, which was one of first to institute works committees in Great Britain.

Scientific Management: A Solution of the Capital and Labour Problem, J. M. Scott-Maxwell. Jl. Instn. Elec. Engrs., vol. 58, no. 291, May 1920, pp. 329-342 and (discussion), pp. 342-376, 2 figs. It is urged that by generalization of industrial management in industry, progress of reconstruction can be accelerated in England.

Scientific Management, H. W. Allingham. Eng. & Indus. Management, vol. 2, no. 26, Dec. 25, 1919, pp. 803-808, 5 figs. Its application in British shops.

Group Working. Grouping Workers to Get Best Results, Eugene J. Benge. Factory, vol. 24, no. 8, May 1, 1920, pp. 1332-1333, 3 figs. It is claimed if each workman in a group produces about same as his neighbor, there is likely to be less dissatisfaction and greater total output. Plan is said to be measure of working force's effectiveness.

The Lincoln Motor Production Plan, I. J. Beatty. Factory, vol. 24, nos. 8 and 9, May 1 and 15, 1920, pp. 1328-1332 and 1547-1549, 2 figs. Notes on handling service cards and explaining group working; dispatching assemblies and recording operations.

Ice Plants. See ICE PLANTS, Management.

Increasing Production. How Three Plant Managers Are Getting Greater Production. Factory, vol. 24, no. 11, June 15, 1920, pp. 1902-1903. First plan is described as economic appeal first to foremen, and through them to employees, in a large loom works; second is more personal appeal which goes directly from management to all employees in factory of about 100 workers; third plan places responsibility for planning on foremen.

See also BONUS SYSTEMS, Foundry Output Increased by.

Inspection. Inspection: The Control of Quality, George S. Radford. Indus. Management, vol. 60, nos. 3 and 4, Sept. and Oct. 1920, pp. 169-172 and 290-294. Sept.: Relation of quality to quantity, cost and marketing. Oct.:

Principles underlying permissible quality variations.

Instructions. Written Instructions as an Aid to Management, M. H. Potter. Eng. & Indus. Management, vol. 2, no. 19, Nov. 6, 1919, pp. 589-590. Suggestions for writing them.

Introduction of. Scientific Management, Henry Atkinson. **Eng. & Indus. Management, vol. 2,** no. 17, Oct. 23, 1919, pp. 522-525. Suggestions in regard to preliminary investigations to make into existing conditions and methods before introducing scientific management.

Labor-Saving. Labour and Labour-Saving Devices, G. F. Zimmer. Electn., vol. 83, no. 2169, Dec. 12, 1919, pp. 657-665, 12 figs. Advocates continuity of process, employment of more scientific methods, including routing of raw materials and objects in course of manufacture, through industrial establishments along shortest possible paths, thereby reducing number and length of conveyors necessary, and lays stress on need for better organization generally.

Lighting vs. Production. Industrial Lighting as an Element in Mass Production, Leon Gaster. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 485-487, 3 figs. Writer points out that the case for good industrial lighting in factories may be stated on three main grounds, namely interests of health, of safety, and of efficiency. Discussion of influence of improved lighting on efficiency and important features in modern industrial lighting.

Machine Records. Keeping Tab on Machines That Loaf, A. B. Burgess. Factory, vol. 24, no. 8, May 1, 1920, p. 1339, 2 figs. Method of showing management at all times number of machines in operation.

Machine Work. See CUTTING METALS, Barth Slide Rules.

Monotony of Work, Relief from. Psychology of the One Man-One Job Problem, Harry Tipper. Automotive Industries, vol. 41, no. 25, Dec. 18, 1919, pp. 1230-1231. Suggests putting before employee opportunity to gain knowledge of products as well as relief from monotony of work.

Number of Machines for Workman. Determination of the Optimum Number of Machines a Workman Should Operate, Arthur S. Otis. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 438-440, 2 figs. Illustrates manner of determining for given selling price per unit that number of machines per operative at which production per machine per day is such that maximum aggregate profit is made that point in production below which overhead expense reduces profits and above which operating expense reduces profits.

Offices. See OFFICE MANAGEMENT.

Operating Stores. Putting a Store in Your Factory, Leon I. Thomas. Factory, vol. 25, no. 6, Sept. 15, 1920, pp. 863-867, 14 figs. Based on experience of 125 plants.

Orders, Control of. Speeding Orders Out of the Shipping Room Door. Factory, vol. 24, no. 11, June 15, 1920, pp. 1882-1884, 2 figs. Describes how orders are controlled to avoid confusion and delay in factory of Greenfield Tap & Die Corporation.

Organization. See INDUSTRIAL ORGANIZATION.

Planning. Improving Shop Methods by Analysis, L. V. Estes. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 306-310. It is noted that scientific analysis has been applied more to shop problems dealing with feeds, speeds, machinery, production times, and the like, than to broader problems of planning and control. Results that can be obtained from both of these groups of analyses are outlined by references to particular problems that have been successfully solved.

Output Planning as a Function of Management, A. Robert Stelling. Eng. & Indus. Management, vol. 3, nos. 4, 9, 19, 21 and 23, Jan. 22, Feb. 26, May 6, 20 and June 3, 1920, pp. 99-100, 259-261, 579-582, 643-647 and 714-716, 20 figs. Jan. 22: Summarizes beneficial results of establishing planning system. Feb. 26: Suggests forms of cards for use in planning work in shop. May 6: States that all manufacturing policies may be divided into three groups when considered from point of view of output planning, namely, uniform production, diverse mass production, and single-unit manufacture. May 20: Outline of routine which is said to give accurate control, prevent waste, cut out all waiting time, economize time in handling and, by bringing all parts together in correct sequence, insure rapidity of turnover. June 3: Discussion of uniform manufactures and single-unit manufacture. See also Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 487-491, 4 figs.

Production Planning and Tracing System. Iron Age, vol. 106, no. 4, July 22, 1920, pp. 183-185, 4 figs. System installed in Moreland Motor Truck Co.'s plant at Los Angeles, Cal. Follow-up record forms are illustrated.

Planning Department. Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 3, nos. 12 and 20, Mar. 18 and May 13, 1920, pp. 355-357 and 611-613, 6 figs. Illustrates diagrammatically relationship between planning department and other departments.

The Importance of Planning in Production Work (Dire Bedeutung der Vorbereitungsarbeiten in der Fertigung), Fritz Kopp. Betrieb, vol. 2, no. 12, June 1920, pp. 265-282, 60 figs. Discusses fundamental principles and shows how even a fabrication difficult with skilled labor can be carried out in this manner.

The Planning Department. Eng. Production, vol. 1, no. 11, Oct. 1920, pp. 428-432, 15 figs. Its function, organization and personnel.

Principles. The Principles of Industrial Management (Les principes de L'Organisation industrielle), Danty-LaFrance. Vie Technique & Industrielle, vol. 1, no. 3, May 1920, pp. 123-127. Industrial management, it is said, is not a science based upon mathematical principles, but rests upon faithful observations of rules and methods of procedure. Necessity of standardizing conditions of work, writing instructions and other practices is concluded.

Production Board. See Production Methods.

Production Control. Graphic Production Control, E. T. Spidy. Ry. Rev., vol. 66, no. 10, Mar. 6, 1920, pp. 364-368, 6 figs. Account, with illustrations, of methods employed at Angus shops of Can. Pacific Ry., in scheduling work through shops, and in accounting for time, labor and materials. From paper read before Can. Ry. Club.

Production Control Through a Routing Department, Norman G. Shidle. Automotive Industries, vol. 43, no. 7, Aug. 12, 1920, pp. 322-325, 6 figs. Operation of production control board and pneumatic-tube system by means of which, it is said, large machine-tool concern is keeping all its machines running efficiently.

Shop Production-Control and Accounting Systems, A. G. Drefs. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 33-38, 3 figs. Graphical method is suggested for securing complete factory costs.

Visualizing Facts for Control, L. V. Estes. Indus. Management, vol. 59, nos. 1, 2 and 3, Jan., Feb. and March 1920, pp. 57-63, 127-133 and 209-214, 15 figs. Jan.: Suggests graphical comparison of performance. Feb.:

Forms for contrasting work which customers' orders already on hand involve with capacity of machines or production centers of factory. March: Explains operation of dispatch board for shop control, control board for shipping goods in mail-order house and chart for production control in manufacturing plant, as examples of control mechanisms.

See also Can. Pac. R. R.; Production Methods.

Production Increase. Increasing Production to Meet Shorter Day, Paul R. Ramp. Iron Age, vol. 104, no. 25, Dec. 18, 1919, pp. 1261-1263. Points out possible application of production machines.

See also Production Methods.

Production Methods. A Plea for Better Harmony Between Theory and Practice. Machy. (Lond.), vol. 15, no. 388, Mar. 4, 1920, pp. 705-716, 40 figs. Coördination of castings and machining operations for production on large scale.

Building Over an Old Plant to Get Doubled Output, O. L. Smith. Factory, vol. 25, no. 6, Sept. 15, 1920, pp. 869-873, 8 figs. Experience of Velie Motors Corporation.

Ford Production Methods, Thomas Gorst. Eng. & Indus. Management, vol. 3, no. 15, April 8, 1920, pp. 451-455, 1 fig. Important detail of system is organization whereby hourly reports come into works superintendent from all departments, these being tabulated and recorded in such a way as to indicate immediately any department which shows signs of falling behind.

How Can We Increase Production? Sidney J. Williams. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 270-272. Address before Eng. Section, Nat. Safety Council.

Increased Production by the Use of Proper Gages, George T. Trundle, Jr. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 80-81. Economy of using gages is emphasized, it is said, by amount of scrap made in manufacturing department by mistakes in reading scales, micrometers and other measuring instruments.

Increasing Production Without a Bonus, Fred H. Colvin. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1041-1044. Part played in plan of management of White Motor Co. by monthly publication, The White Book, in which, it is said, all questions are freely and frankly discussed.

Installing Gantt Production Methods, Wallace Clark. Indus. Management, vol. 59, no. 6, June 1920, pp. 443-448. System which permits foremen to fill his orders as rapidly as possible and in proper sequence, and to operate every machine when there is work for it to do.

Interdepartment Production Contest, R. R. Potter. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 258-262, 4 figs. Experience at plant of Fuller & Sons Mfg. Co., Kalamazoo, Mich.

Interesting Shop Employees in Shop Output. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 535-536, 2 figs. Schemes of displaying comparison of man-hour production for information of men.

Interesting Test of Comparative Production. Iron Age, vol. 105, no. 22, May 27, 1920, p. 1513. Employees of American Multigraph Co., Cleveland, have proposed through their representatives to management to put out as large product in eight hours as in nine or return to old schedule. Experiment is now being conducted and results will be determined in six months.

Job Analysis Aid to Production, J. D. Hackett. Iron Trade Rev., vol. 67, no. 11, Sept. 9, 1920, pp. 722-724, 1 fig. Suggested forms of job specification to bring qualifications of worker and requirements of job together.

Keeping Production up with Sales, H. S. Hamilton. Factory, vol. 25, no. 6, Sept. 15, 1920, pp. 873-875, 3 figs. Individual production charts.

Keeping the Factory Busy all the Year 'Round, E. Newman. Factory, vol. 25, no. 6, Sept. 15, 1920, pp. 876-879, 1 fig. Method of planning work in factory manufacturing women's garments.

"Limits" and Their Relation to Increased Production, W. Groocock. Eng. & Indus. Management, vol. 3, no. 17, Apr. 22, 1920, pp. 515-517. The question of mass production of individual commodities is said to be intimately associated with principle of utilizing labor-saving machines for production of numerous articles which are at present employing large amount of manual labor. Discussion of problems of organization and machinery for production of such labor-saving machines.

Mass Production, H. W. Allingham. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 478-479, 3 figs. Writer points out difficulties of mass production in engineering and discusses mass production in a gas-fittings factory, the motor-car industry, etc.

Modern Production Methods, W. R. Basset. Am. Mach., vol. 52, nos. 15, 17, 19, 21, 23, 25, Apr. 8, 22, May 6, 20, June 3, 17, 1920, pp. 761-764, 873-876, 1003-1008, 1087-1090, 1177-1182, 1285-1288 and vol. 53, nos. 1, 2, 5, 14 and 16, July 1, 8, 29, Sept. 30 and Oct. 14, 1920, pp. 17-20, 63-66, 215-219, 619-625 and 709-711, 52 figs. Apr. 8 and 22: Importance of careful advanced planning of production is pointed out. Discusses purchasing as a tool of production; describes and contrasts different methods of buying. May 6: Need for systematic stock keeping is pointed out and record forms are illustrated. May 20: Organization of engineering department. June 3: Tool-order forms and follow-up cards. June 17: Discusses two types of machine layout, and gives details of an actual case of laying out a plant. July 1: Takes up planning of production so that all necessary machines reach assembly floor at same time. July 8: Developing machine load from schedule control. July 29: Discusses control of work in shop and describes "booth" system. Sept. 30: Planning in shop where wide variety of articles is manufactured. Oct. 14: Utilizing cost system for increasing production.

Organizing for Production. Eng. Production, vol. 1, nos. 8 and 11, Aug. and Oct. 1920, pp. 289-292 and 404-408, 18 figs. Procedure in American works manufacturing automobile carburetors.

Phases of Works Management, H. Mensforth. Eng. & Indus. Management, vol. 3, no. 10, Mar. 4, 1920, pp. 306-308. Influence of policy followed by employment department of production.

Production Board at Marchant Calculating Machine Company. Metal Trades, vol. 11, no. 8, Aug. 1920, pp. 333-336, 6 figs. Production board devised to route work in such a way as to make it possible to determine at any time present status of any job in the factory, and to permit checking of costs at any time.

Production Methods in the British Automobile Plants, M. W. Bourdon. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1461-1462. Despite schedules for larger outputs English factories, it is said, generally continue pre-war methods of machining and assembling. There is, however, it is noted, greater accuracy in manufacture and greater tolerance where narrow limits are unnecessary, as for instance, in external finish.

Production Methods in Shipbuilding, William B. Ferguson. Indus. Management, vol. 60, no. 1, July 1920, pp. 43-48, 2 figs. After describing methods of planning, sequencing material and establishing erection schedule, writer quotes superintendent in charge as saying that "standard requisitions have assisted me immeasurably in putting our division in the lead."

Production Records at the Hart-Parr Factory, A. W. Sawyer. Am. Mach., vol. 53, no. 10, Sept. 2, 1920, pp. 445-446, 2 figs. Describes production department of firm of tractor manufacturers in Charles City, Ia., with a system of reports and printed blanks sent in each day from all producing centers of the works, by which it is possible to discern at a glance just what progress is being made with year's plan and in what relation each necessary part stands to every other part.

Putting Across a Campaign for Greater Production. Factory, vol. 24, no. 7, Apr. 15, 1920, pp. 1133-1137, 3 figs. Experience of National Cash Register Co. in introducing plan which is said to have turned a 32 per cent slump in output into increase over previous records.

The Lincoln Motor Production Plan, I. J. Beatty. Factory, vol. 24, no. 4, Mar. 1, 1920, pp. 623-626, and vol. 25, no. 1, July 1, 1920, pp. 38-41, 11 figs. Mar. 1: Records of receiving, manufacturing and shipping. July 1: Method of receiving and storing material.

The Manufacture of Household Appliances, J. V. Hunter. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1173-1174, 5 figs. Method employed for quantity production by Hurley Machine Co., Chicago.

The Question of Production, John Holloway. Eng. & Indus. Management, vol. 3, no. 2, Jan. 8, 1920, pp. 40-43. Suggests collaboration and exchange of ideas between different manufacturers as to best plans of increasing production and setting up Central Consulting Council in various districts of country (England) which would constitute an avenue through which ideas and practices for intensified production could be distributed.

See also Group Working; Shipbuilding.

Progress Department. The Progress Department —Does It Pay? W. J. Hiscox. Machy. (Lond.), vol. 16, no. 403, June 17, 1920, pp. 335-336. It is emphasized that if the department is to be of value it must be staffed with efficient workers.

Purchasing Data, Recording. Economic Value of Good Buying, Wilfred G. Astle. Elec. Traction, vol. 16, no. 5, May 1920, pp. 324-326. Emphasizes economy of introducing efficient system of keeping all buying data.

Purchasing Methods. Planning Efficient Purchasing, M. H. Potter. Iron Trade Rev., vol. 66, no. 4, Jan. 22, 1920, pp. 286-289, 9 figs. Writer gives rules and suggestions for guarding against inferior goods and points out value of standardizing methods. Illustrations of form cards suitable for purchasing department are presented.

Purchasing Organization. Purchasing and Stores Organizations, H. B. Spencer. Off. Proc. N. Y. Railroad Club, vol. 29, no. 8, Oct. 1919, pp. 5691-5698. As established by U. S. Railroad Administration.

Railway Shops. Railroad and Industrial Shop Management, C. C. Edmonds. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 513-514. Situation in railroad shops compared with industrial conditions.

Rate Setting. Budget as Basis for Calculating Predetermined Rates, E. O. Sommer. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 24-28. Method is shown for preparing sales and operation cost budget and predetermining rates therefrom. It is stated that introduction of budget is stimulus to sales force, a guide to economy for factory manager and valuable aid to cost accountant.

Setting a Job Time Limit, S. B. Keator. Factory, vol. 24, no. 2, Feb. 1, 1920, pp. 268-269. Experience of factory where time necessary for job is estimated and workmen paid accordingly even if he finishes several hours earlier. It is said that this plan has increased output, decreased cost and made satisfied employees.

See also TIME STUDY, Rate Setting.

Record Forms. See Production Methods.

Record Sheets. Piecework System by Which Clerical Work is Done Almost Entirely by Office Machines (Akkordsystem mit fast ausschliesslich durch Büromaschinen verrichtbaren Schreibund Rechenarbeiten), Carl Rüsch. Werkstattstechnik, vol. 14, no. 6, Mar. 15, 1920, pp. 164-170, 12 figs. Gives illustrations of the various record sheets and describes system employed by machine-tool concern with 650 workmen, which manufactures tools used in all the other workshops of a large plant.

Records, Filing of. Purchasing Department Records, G. W. Greenwood. Indus. Management, vol. 59, no. 5, May 1920, pp. 383-386, 4 figs. Method is suggested for filing filled purchase orders so that any particular item can be readily located with no other information than name of part in question.

Results from. Scientific Management: A Solution of the Capital and Labor Problem, J. M. Scott Maxwell. Machy. (Lond.), vol. 15, nos. 377 and 378, Dec. 18 and 25, 1919, pp. 366-369, 2 figs., and 354-357. Economical aspect of payment-by-results system. Gives charts showing comparison of efforts extended in manufacturing operations by experienced and inexperienced workers.

Routing. Following up Belated Deliveries. Eng. and Indus. Management, vol. 4, no. 4, July 22, 1920, pp. 100-101, 1 fig. Scheme adopted by large works for following up of materials on order.

Planning and Controlling Production, R. DeArmond. Machy., vol. 15, no. 378, Dec. 25, 1919, pp. 388-393, 13 figs. An outline of system used by R. K. LeBlond Machine Tool Co. for routing work through plant according to predetermined plan and controlling production.

Routing Considered as a Function of Up-to-Date Management, H. K. Hathaway. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 278-286, 10 figs. Sets forth principles and purposes of routing, its history and elements of its technique. How to control flow of production by efficient routing of materials.

Routing Gears and Machine Parts Through the Factory, J. A. Urquhart. Am. Mach., vol. 52, no. 24, June 10, 1920, pp. 1231-1236, 11 figs.; also Iron Age, vol. 105, no. 20, May 13, 1920, pp. 1375-1379, 9 figs. System covering ordering, planning, scheduling and dispatching in use by Brown & Sharpe Mfg. Co. Paper read before Am. Gear Manufacturers' Assn.

Saving in Direct Routing of Work, H. H. Edge. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 410-411, 4 figs. Sketches illustrating direct routing through shop of various automobile-engine parts.

Stock Parts and Their Routing, L. D. Burlingame. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 617-621, 12 figs. System of classifying, ordering, routing and storing of stock parts at plant of Brown & Sharpe Co.

Work-Routing and Cost-Accounting System of the Standard Gas Engine Company. Metal Trades, vol. 11, no. 2, Feb. 1920, pp. 82-85,

10 figs. System installed at East Oakland is said to have been found entirely satisfactory after several months of trial. Illustrations are given of sheets and cards used in system.

See also COST ACCOUNTING, Routing and Cost Keeping.

Scheduling and Routing. Scheduling and Routing Work in the A.E.F. Shop, C. E. Lester. Ry. Mech. Engr., vol. 94, no. 2, Feb. 1920, pp. 97-102, 16 figs. Methods used to increase production in shop of railroad engineers at Nevers, France.

Shipbuilding. Industrial Engineering Applied to Shipyard Management, Norman Howard. Indus. Management, vol. 59, nos. 5, 6 and May, June, 1920, pp. 372-376, 492-495, and vol. 60, no. 1, July 1920, pp. 38-42, 17 figs. Elements worked out as standard practice by Industrial Management Section of Emergency Fleet Corporation.

Organisation in Shipbuilding Yards, T. W. McAlpine. Eng. & Industrial Management, vol. 4, no. 14, Sept. 30, 1920, pp. 422-423. Suggestions for improvement.

Production Methods in Shipbuilding, William B. Ferguson. Indus. Management, vol. 59, no. 6, June 1920, pp. 439-443 and vol. 60, nos. 3 and 4, Sept. and Oct. 1920, pp. 226-232 and 295-300, 9 figs. Relation of supervision to planning and scheduling is taken up, and organization of shipyard is discussed with particular reference to functions of manager and his staff. Notes on setting standards of performances. Cost-keeping basis for production control.

Results Obtained by Applying Scientific Management in a French Ship Yard, M. Lavallée. Indus. Management, vol. 60, nos. 3 and 4, Sept. and Oct. 1920, pp. 240-244 and 287-289, 1 fig. Results of application of Taylor's principles to shipyard employing 3000 men at Chantier de Penhoet (Saint-Nazaire). Translated from paper presented before Société d'Encouragement pour l'Industrie Nationale.

Sequencing Material in Shipbuilding, O. E. Mills. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 433-438, 7 figs. Illustrates how to plan building of ship and secure control through sequencing and bill of material for steel. Reference is made to practice at Hog Island Yard.

Shipyard Notes. Shipbuilding & Shipping Rec., vol. 15, no. 8, Feb. 19, 1920, pp. 239-241, 2 figs. Suggestions for increasing output of shipbuilding yards.

Shop Methods, Analysis of. Improving Shop Methods by Analysis, L. V. Estes. Indus. Management, vol. 59, no. 5, May 1920, pp. 367-371. It is shown how analysis provides facts upon which shop man can base improvement of his methods.

Shop Orders. Works Organisation, E. Mortimer Rose. Mech. World, vol. 67, no. 1732, March 12, 1920, pp. 165-166, 4 figs. Suggested forms for work shop orders.

Shops. Coördinating Shop Management, M. H. Potter. Iron Trade Rev., vol. 65, no. 25, Dec. 18. Balancing of production, division of functional departments and systematizing of control explained.

Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 2, no. 20 and 22, Nov. 13 and 27, 1919, pp. 626-630 and 679-681, 10 figs. Diagrams illustrating relationship between various departments.

Shortages, Checking. The Lincoln Motor Production Plan, I. J. Beatty. Factory, vol. 24, no. 11, June 15, 1920, pp. 1879-1882, 2 figs. Deals with handling of defective material and checking shortages, showing operation check card which enables tracer to locate any lot at any point in its progress through plant, and inventory card for locating errors in records.

Standardization. Standardizing the Job, M. R. Lott. Factory, vol. 23, no. 6, Dec. 1919, pp. 1290-1292, 2 figs. Suggested names and definitions for trades.

Standardizing Works Methods, M. H. Potter. Iron Trade Rev., vol. 65, no. 22, Nov. 27, 1919, pp. 1449-1451, 8 figs. Shows how success of mechanical operations depends on system employed for handling of men, and how standardization may be applied to duties of various departments, executives and employees to obtain best results from standardization of shop practice.

Steel Stores. See STORING MATERIALS, Steel.

Storekeeping. Company Stores—Do They Pay? E. E. Adams. Iron Trade Rev., vol. 67, no. 6, Aug. 5, 1920, pp. 374-377, 4 figs. Writer believes industrial stores do not aid employers in securing labor, but he adds that as buying agencies they are justified by surprising results. Paper read before Am. Drop Forge Assn.

How Do You Regulate Materials? Henry H. Farquhar. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 151-152, 1 fig. Considerations in regard to issuing goods from storeroom, and classification of materials. Principles to be kept in mind in arranging inter-relationships between various officials entrusted with maintaining material control.

Putting a Store in Your Factory, Leon I. Thomas. Factory, vol. 25, no. 5, Sept. 1, 1920, pp. 687-690. Replies from 120 plants to inquiry concerning their experience with cooperative stores.

Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 3, no. 25, June 17, 1920, pp. 771-774, 3 figs. Methods of storekeeping.

Storeroom Methods. Receiving and Delivering Shop Stores, H. B. Twyford. Iron Age, vol. 105, no. 7, Feb. 12, 1920, pp. 469-471, 4 figs. Forms are suggested for stores records, common faults in storekeeping are pointed out and remedies to overcome them are recommended.

Stores Accounting. Mechanical Department Stores Accounting, Thomas Kennedy. Elec. Ry. Jl., vol. 56, no. 15, Oct. 9, 1920, pp. 717-720, 8 figs. Method used by Tri-City Ry. & Light Co., Iowa. Paper presented before Iowa Elec. Ry. Assn.

Stores Organization. See Purchasing Organization.

Stores System. Modern Stores System Proves Successful in Strip Mill, H. R. Simonds. Iron Trade Rev., vol. 66, no. 17, Apr. 22, 1920, pp. 1197-1202, 10 figs. Record forms used in stores system of Am. Tube & Stamping Co., Bridgeport, Conn.

See also Production Methods.

Storing Materials. Easily Stored—Quickly Found. Factory, vol. 24, no. 11, June 15, 1920, pp. 1900-1901. Illustrations of twelve different arrangements for housing raw or finished stock which, it is claimed, have given good results.

How Do You Regulate Materials? Henry H. Farquhar. Am. Mach., vol. 53, no. 3, July 15, 1920, pp. 101-104, 4 figs. Receiving and storing of materials.

Taylor System. See TAYLOR SYSTEM.

Time Study. See TIME STUDY.

Tool and Fixture Control. Tool and Fixture Control in Woodworking, Carle M. Bigelow. Indus. Management, vol. 59, no. 4, Apr. 1920, pp.

284-287, 11 figs. Writer shows losses and inefficiencies arising from unscientific tool and fixture control, and gives in detail practice he has developed for designating all kinds of patterns and tools and storing them systematically and keeping them in repair. He also gives method for controlling repair work of machines and equipment.

Toolrooms. See TOOLROOMS, Efficiency in.

Toolroom Organization. Toolroom System, E. E. Hirschhauter. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 358-360, 9 figs. System said to have been in successful use for last five years in large gas-engine shop.

Tool Room Organization. Eng. & Indus. Management, vol. 3, no. 8, Feb. 19, 1920, pp. 233-235, 4 figs. Suggestions in regard to organization of tool room in factory.

Tool-Salvage Department. Tool Salvage Department, C. B. Cole. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 435-437, 3 figs. Suggestions in regard to organization, routine, and system of tool salvage department.

Tool-Storage System. A Group Tool Storage System, Peter F. O'Shea. Am. Mach., vol. 51, no. 20, Nov. 13-20, 1919, pp. 887-889, 4 figs. Tool crib, tool identification card, and belt-storage rack in machine shop of large plant.

Woodworking Industry. Installing Management Methods in the Woodworking Industry, Carle M. Bigelow. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 388-399, 18 figs. Data in regard to cutting speeds and feeds. Functions of employment, industrial relations, time study and rate setting, and wage payment systems.

Scientific Management—Its Application to the Wood-Working Industry—H. J. P. Hameetman. Wood-Worker, vol. 38, no. 9, Nov. 1919, pp. 33-34. Concerning design of building, selection and arrangement of machinery and equipment.

See also WOODWORKING INDUSTRY, Management Methods.

Worker's Reaction to. The Worker's Reaction to Scientific Management, William R. Leiserson. Bul. of Taylor Soc., vol. 5, no. 4, Aug. 1920, pp. 160-166. Real problem of management, writer emphasizes, is primarily the method of putting psychology into the practice. He gives illustrations as to workmen's reaction to management.

See also INTERCHANGEABLE MANUFACTURE.

INDUSTRIAL ORGANIZATION

Allocation of Authority. Organizing for Work, H. L. Gantt. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 772-776, 4 figs. Suggests (1) making industry democratic by placing authority in hands of those who know what to do and how to do it, irrespective of whether they are owners of tools of production or not, and (2) seeking solution of all industrial problems by presenting all facts available or obtainable in manner readily comprehended by all.

Coöperation of Departments. System and Organization as They Fit Commercial Activities. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 30-31. Points out necessity for close coöperation between commercial and production departments. Paper read before Am. Gear Manufacturers' Assn.

English Works. The Organization of a Modern Engineering Works, with Some Observations Upon the Construction of Special Machinery, the Science of Production, the Training of Pupils and Trade Apprentices, and "Welfare," Richard W. Allen. Proc. South Wales Inst. of Engrs., vol. 36, no. 1, July 16, 1920, pp. 91-118. Based on organization of Messrs. W. H. Allen Sons & Co., Queen's Engineering Works, Bedford, England.

Laws of. Laws of Industrial Organization, C. E. Knoeppel. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 494-498 and vol. 59, nos. 1 and 2, Jan. and Feb. 1920, pp. 43-47 and 145-148. Concentration, individualism and mental capacity as factors of organization are explained and their importance emphasized. Importance of specialization, responsibility, and permanency as elements in fostering productive power of industry.

Phonograph-Motor Shop. The Organization, System and Routine in a Phonograph-Motor Shop, W. E. Thompson. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 127-131, 21 figs. System and methods in use at plant of Tiffany Motor Co., West New York, N. J.

Power-Plant Employees. Efficient Organization of Power Plant Help, H. A. Wilcox. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 174-176. Points out duties and responsibilities of central-station operators.

[See also FACTORIES, Organization for Mass Production.]

INDUSTRIAL PLANTS

Protection. Insuring Protection to Industrial Plants, Walter F. Mulhall. Iron Trade Rev., vol. 67, no. 9, Aug. 26, 1920, pp. 581-584, 8 figs. Heavy wire fences and powerful flood lights used to guard mills and factories against intrusion and malicious damage. Opinion is formed that every steelworks organization should include guards whose whole time is given to policing of company property.

INDUSTRIAL RAILWAYS

See RAILWAYS, Industrial.

INDUSTRIAL RELATIONS

Advisory Committees. See Rock Island Plan.

Americanization. Better Americans, Better Workers—at Slight Expense, C. A. Livingston. Factory, vol. 23, no. 6, Dec. 1919, pp. 1302-1305, 3 figs. How labor trouble developed and was later overcome at Chicago plant of Armour & Co.

Arbitration. Plan for National Industrial Arbitration. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 1-7, 1 fig. Preliminary Report of President Wilson's second industrial conference. It proposes extensive federal machinery to be used to adjust or disclose causes for disputes between employers and employees. Full text of proposed plan is included.

Australia. Development of the Labor Situation in Australia. Monthly Labor Rev., vol. 11, no. 1, July 1920, pp. 59-66. Two systems are in operation in Australia for regulation of wages, hours and general conditions of labor; "wages board" system, general aim of which is prevention of disputes by regulation of wages, hours and by special board appointed for specific industry on application or petition; and "industrial arbitration court" system, under which industry does not ordinarily come under review until dispute had actually arisen. Neither operates satisfactorily.

Betterment Plan. Laws of Industrial Organization, C. E. Knoeppel. Indus. Management, vol. 59, no. 3, March 1920, pp. 184-191. Plan of industrial betterment submitted by C. E. Knoeppel & Co., Inc., consulting engineers, to first industrial conference called by President Wilson.

British Labor, Attitude of. The Attitude of British Labor Toward Employers, J. R. Clynes. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 730-731. Writer is member of parliament for labor party. Paper read be-

fore Industrial League and Council in England.

Capital and Labor. Competition, Combination and Coöperation, S. P. Robins. Can. Ry. Club, vol. 18, no. 7, Oct. 1919, pp. 17-31. Observes that "capitalists like workmen are at liberty to pursue their own interests in the way which they think best, provided always that way is not unethical," but "what is certainly wrong is that combinations of capitalists should disregard all considerations of justice, humanity and civilization in order to attain their own ends."

Collective Bargaining. Can Industrial Democracy be Efficient? The Rochester Plan, Meyer Jacobstein. Bul. of Taylor Soc., vol. 5, no. 4, Aug. 1920, pp. 153-159. Scheme of collective bargaining as operated by Clothier's Exchange of Rochester which comprises about 19 manufacturers in whose plants work 15,000 people.

Collective Bargaining in Practice, Dudley R. Kennedy. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 149-152. Argues that collective bargaining must be accepted or rejected not on its theory but on its practical application in industry; and that collective bargaining of organized labor is the closed shop with all bargaining done by trade-union officials.

Essentials of a Labor Contract, Edwin Gruhl. Aera, vol. 8, no. 6, Jan. 1920, pp. 712-719. Collective bargaining backed by individual responsibility of employees is urged.

Taft, Hughes and Hoover on Collective Bargaining. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 93-97. Quotations from their public addresses as reported in press dispatches.

Community Spirit. Community Spirit in Small Industrial Town, Edwin A. Hunger. Iron Age vol. 106, no. 17, Oct. 21, 1920, pp. 1038-1040, 5 figs. Development of one-big-family idea among employees by moving to village. Experience of Black & Decker Mfg. Co., maker of portable electric drills, automobile air compressors and valve grinders.

Control of Industry. The Control of Industry, Ernest J. P. Benn. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 473-475. Writer contends that "we must recognize an actual moral and political equality which was not factor to be reckoned with when industrial system was founded and perfected, and must make up our minds that we shall never return to old relative status of master and man, which was basis upon which factories and business and trading concerns generally were founded."

Coöperation. See CO-OPERATION, Industrial.

Courts. See Disputes; Kansas Industrial Court.

Developments. The Long March of Industrial Relations, Harry Tipper. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 732-733. Reports that three employees are to be elected to directorship of large industrial concern.

Disputes, Adjustment of. Adjustment of Labor Disputes in Packing House Industries. Monthly Labor Rev., vol. 11, no. 1, July 1920, pp. 101-105. From seven pamphlets issued by U. S. Administration for Adjustment of Labor Questions arising in certain packing-house industries.

Disputes, Court for. The Industrial Courts Act (1919) of Great Britain. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 41-46. Established "for the purpose of the settlement of trade disputes." It is legislated that there shall be a standing industrial court consisting of persons to be appointed by the Minister of Labor, "of whom some shall be independent persons, some shall be persons representing employers, and some shall be persons representing workmen, and in addition one or more women."

Employers as Leaders of Workingmen. Leadership and Education the Cures for Our Industrial Ills, Dr. Charles E. Eaton. Coal Age, vol. 17, no. 24, June 10, 1920, pp. 1201-1204. Writer believes that employer of workingmen should make himself their actual leader, because, he says, failure to do so makes possible the demagogue and self-seeker.

Employers' Association. Association Lessens Labor Difficulties, Gerard Frazar. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 654-657, 5 figs. Industrial situation stabilized in Hartford County, Conn., by coöperative organization of 160 manufacturers.

Employment Management and. See EMPLOYMENT MANAGEMENT, Industrial Relations and.

Engineer and Personnel. Industrial Personnel Relations, A. H. Young. Jl. Western Soc. Engrs., vol. 24, no. 6, June 1919, pp. 341-350 and (discussion) pp. 350-358. Position of engineer on industrial personnel problem.

Engineers. See ENGINEERS, Industrial Relations of.

Factory, Improvement of. The Benefits of Details in Plant Management, Harry Tipper. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 34-35. Calls attention to small details in plant management which can be made to work for benefit of contentment and good will.

Foremen. Industrial Democracy and the Foreman. Iron Age, vol. 104, no. 25, Dec. 18, 1919, pp. 1265-1266. Points out that "contented and coöperative employee will be exceptionally efficient and productive if he is scientifically directed with special incentives, modern methods and appliances, and if he ignores all labor restrictions on output and narrow trade demarcations." Paper read before Am. Foundrymen's Assn.

The Economic Waste Due to Relations Between Foremen and Employes, Whiting Williams. Bul. Dept. of Labor & Industry, vol. 7, no. 4, 1920, pp. 32-38. Experience of writer, who, for purpose of investigation, worked as unskilled laborer in steel mills.

Future Development. The Future of Industrial Relations, Dudley R. Kennedy. Indus. Management, vol. 59, no. 3, March 1920, pp. 227-231. Writer sees assurance of permanence of industrial management in continuance of such work "by many of the largest, the most progressive, the most prosperous concerns in the country."

Great Britain, Status in. Status of Industrial Relations in Great Britain, Clarence H. Northcott. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 64-66. Situation is described as follows: Trade unionism has been officially recognized, wages are much higher than before the war, working hours are less, through Whitly councils workers have share in their own management and there is proposal pending to establish economic parliament composed of representatives of employers and workers.

Human Factor. The Human Factor in the Operation of Industry, Henry R. Seager. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 886-887. Four ways of handling labor problems that are currently being tried are discussed: (1) Method of just and generous small employer who keeps in touch with needs of his employees and anticipates their needs; (2) method of large corporations, which tries by means of welfare workers and profit-sharing to content employees and discourage them from going in labor organizations; (3) method of shop committee; and (4) plan of joint industrial councils.

Improvement of. The Development of Industry, J. E. Brown. Eng. & Indus. Management, vol.

2, no. 26, Dec. 25, 1919, pp. 810-812. Observes that means of dispelling atmosphere of distrust between labor and capital must take prominent place in any scheme of improving industrial position.

Industrial Conference. Human Relations in Industry. Am. Mach., vol. 53, no. 14, Sept. 30, 1920, pp. 613-615. Survey of papers presented at industrial conference held at Silver Bay, N. Y., Aug. 27 to 29.

Industrial Democracy. Personal and Economic Relations, L. V. Estes. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 453-457. Writer contends that industrial engineer is the one most likely to work out satisfactory arrangements between employer and employees. From this viewpoint he discusses movement of industrial democracy, points out its weaknesses and fallacies and declares that the word "democracy" applied to such plans is a misnomer.

Justice in. Industry's One Law "Be Square with Your Men," Ernest E. Bell. Iron Trade Rev., vol. 67, no. 3, July 15, 1920, pp. 169-172 and p. 177. Emphasizes that lasting success is only attained by understanding and utilizing human element in accordance with principles of justice.

Kansas Industrial Court. The Kansas Court of Industrial Relations, P. F. Walker. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 290-293. Law creating Court of Industrial Relations became effective on Jan. 24. It is said that law has confidence of all parties of state. Events leading to passage of law are related and its general provisions quoted.

The Kansas Industrial Court, K. H. Condit. Am. Mach., vol. 53, no. 17, Oct. 21, 1920, pp. 749-752. Account of its developments and description of its features.

Labor Organizations. How the Employer May Control the Changing Demands of Radical Labor, Harry Tipper. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 784-785. Advocates formation of labor organization within each factory which should permit collective bargaining and meet through needs of workers. Labor, writer says, is being influenced by men possessing no constructive ability who are drawing workers away from their old leaders by virtue of irresponsible promises and criticisms of deficiencies of union system.

Labor Problem. Solving the Labor Problem, George M. Verity. Sci. Am., vol. 123, no. 13, Sept. 25, 1920, pp. 304 and 313-314. Industrial policy of American Rolling Mill Co.

Labor-Problem Solution. Efforts Toward Solving the Problem of Industrial Relations, Percy E. Barbour. Jl. Worcester Polytechnic Inst., vol. 23, no. 1, Nov. 1919, pp. 34-53. Survey of methods adopted on government plan for solving internal industrial problem by several of largest industries in U. S. A. and England.

Legislation Required. View on Industrial Relations, Daniel Guggenheim. Eng. & Min. Jl., vol. 109, no. 4, Jan. 24, 1920, pp. 252-254. Legislation which affects present-day business, it is pointed out, must be such as will make proper provision for settlement of industrial disputes, compel proper living and working conditions, and eliminate industrial unrest.

Lessons of Labor Crisis. Lasting Lessons of the Labor Crisis. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 89-93 and 96a-96b. Comments on letter by Franklin K. Lane, Secretary of the Interior, to editor of Indus. Management in which Secretary Lane states that "chief delinquency in this present government" has been "lack of engineering." Efforts of industrial conference called by President are explained.

Loyalty of Workers. Worker's Opinion of Company Dependent Upon Actions of Minor Executives, Harry Tipper. Automotive Industries, vol. 42, no. 5, Jan. 29, 1920, pp. 374-375. Writer points out that average worker is ignorant of aims and ideals of firm for which he works and his loyalty to the company is affected principally by his personal relations with his immediate superior. He therefore concludes that more than mere technical skill is necessary in the minor executive.

Magazines for Employees. The Function of the Employes Magazine, E. B. Archley. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 759-761. Experience of railway company in securing contentment of employees by publishing in company organ notices warning men against activities of agitators.

Mining. See MINING, Industrial Relations.

Mining Industry. Industrial Relations in the Mining Industry, Chas. F. Willis. Arizona Min. Jl., vol. 3, no. 6, Nov. 1919, pp. 3-5. Their establishment is needed, writer observes, because psychology of miner is no different from that of any other worker, but he points out special conditions in industry which necessitate modification of systems followed in workshops.

Labor Problem in the Mining Industry, Charles L. Fay. Coal Indus., vol. 2, no. 12, Dec. 1919, pp. 552-554. Democratic and autocratic control compared.

Open Shop. Detroit Vindicates Open Shop, A. J. Hain. Iron Trade Rev., vol. 67, no. 9, Aug. 26, 1920, pp. 571-574. Fourth city has attained its greatest growth under policy of freedom in industrial employment relations.

How Seattle Fights Unfair Labor Unions. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1055-1057. It is said associated industries have already accomplished much for open shop. Facts about radical movement in 1919.

Nation Swinging to Open Shop, A. J. Hain. Iron Trade Rev., vol. 67, no. 13, Sept. 23, 1920, pp. 846-852. Survey of activities in behalf of open shop in United States revealed that in 240 cities of 44 states efforts are being made to promote "the American principle in employment relations." Included among these agencies are 23 national trade and industrial associations, many of which also have branch organizations in principal industrial cities.

Open Shop Gaining in South, Harold F. Podhaski. Iron Trade Rev., vol. 67, no. 12, Sept. 16, 1920, pp. 787-789, 2 figs. Predicts 90 per cent of industries will soon be operating under this plan. Text of open-shop platform adopted by New Orleans Board of Trade and Association of Commerce is included.

The Open Shop a National Demand, Michael J. Hickey. Am. Industries, vol. 21, no. 3, Oct. 1920, pp. 26-28. It is reported that rotary clubs, chambers of commerce, hotel men's associations, bankers' associations, school organizations and fraternal organizations join in demand for industrial freedom all over the country.

The Open Shop Needed for Industrial Welfare, G. W. Dyer. Am. Industries, vol. 20, no. 11, June 1920, pp. 31-32. Necessity for open shop is concluded from consideration that efficiency of a strike depends upon maintenance of closed shop, and strike is "a conspiracy on the part of a small minority to throw the whole social organism into jeopardy and thus by terrorism and threats against the innocent, force society to meet its arbitrary demands."

Profit Sharing. See PROFIT SHARING.

Progress in Harmonizing. Labor Statistics Give Definite Industrial Facts. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 259-267. Optimistic view is presented of labor situation and it is said that latest labor statistics show industrial conflict is not on the in-

crease and that definite progress is being made toward peaceful settlement of industrial disputes.

Public Status in. Capital, Labor and the Public, Robert Julius Andersen. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 117-119. Points out that "we have had too much one-sidedness on this subject" of bringing capital and labor together and that before better relations can be brought about between these forces pleas of the third party, namely, the public, must be heard.

Rock Island Plan. Employees Advisory Plan of the Arsenals, Newton D. Baker. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 400-402. Statement of Secretary of War in regard to establishing advisory workers' organization at Rock Island Arsenal.

The Truth About the Rock Island Plan, Gilbert L. Lacher. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1329 and 1369-1370. Claims that arsenal scheme of employee organization is neither subversive to discipline nor prejudicial to authority of management.

Shop Committees. See EMPLOYEES' REPRESENTATION, Shop Committees.

Strikes. Essentials of a Labor Contract, Edwin Gruhl. Elec. Traction, vol. 16, no. 1, Jan. 1920, pp. 9-13. Contract as means of eliminating strikes.

Laws of Industrial Organization, C. E. Knoeppel. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 381-383. After pointing out fallacies held by both capital and labor writer emphasizes strategic position of management and makes appeal for organization of management to force cessation of industrial strikes.

The Law and the Labor Unions, Kenneth M. Spence. Indus. Management, vol. 59, no. 6, June 1920, pp. 433-438. Exposition of law governing coal, railroad and other strikes. Rights and limitations of employees to strike and of employers to close their plants and cease to do business, are explained. It is demonstrated how certain rights that belong to an individual do not belong to a combination of individuals. Theory is advocated that disputes in industry should be determined on a broader basis than mere law, by applying social and economic principles.

Trade Papers and Labor Problems. Industrial Magazines and Labor Conditions, Harry E. Cleland. Chem. and Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 682-683. How business papers can help to solve labor question. Paper read before Assoc. Advertising Clubs of the World.

Unrest. Industrial Unrest. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 884-885. Historical survey of industrial unrest in United States.

Science and Social Unrest, Ernest R. Grove. Sci. Monthly, vol. 10, no. 2, Feb. 1920, pp. 157-162. Situation in the world is attributed to "impossibility of a people socially unscientific living a satisfactory life in a scientific era." The way out is foreseen to be "through popularizing of the spirit of science," that is, "socializing of science and the acceptance on the part of the scientist of his obligation as a public teacher."

The Causes of Industrial Unrest and the Remedy, Frederick P. Fish. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 17-23 and 72. Writer claims that labor unions have promoted inefficiency and decreased production and notes that employers have been remiss in regard to industrial relations. In his opinion each shop must work out its own problem through fair, cordial and sympathetic coöperation.

The Industrial Unrest: A Study of Present Conditions in Industry, with Some Suggestions, Charles H. Eglee. Jl. Boston Soc. Civ. Engrs., vol. 6, no. 9, Nov. 1919, pp. 317-329 and (discussion) pp. 329-339. Opinions expressed by noted engineers and other authorities in England and United States.

The Modern Specialist in Unrest, E. E. Southard. Indus. Management, vol. 59, no. 6, June 1920, pp. 462-466. Thought is developed that trained psychiatrist should become the consultant of industry, particularly in regard to matters which tend to increase or lessen feelings of unrest in individuals.

See also Strikes.

[See also ENGINEERS, Industrial Relations; INDUSTRIAL DEMOCRACY; PROFIT SHARING; STRIKES; TRADE UNIONS, Federal Incorporation.]

INDUSTRIAL TRUCKS

Belmont. The Belmont Trucking System, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 23, June 3, 1920, pp. 729-730, 8 figs. Description of Belmont lifting truck, which, it is said, requires only one frame which is raised or lowered relative to wheel axles, as against a fixed or rigid lower frame, with separate upper one, which is raised by means of an inclined surface. Advantages of system are enumerated.

Electric. Electric Trucks and Tractors in Printing Plants, Bernard J. Dillon. Elec. Rev., vol. 75, no. 22, Nov. 29, 1919, pp. 895-897, 3 figs. Illustrating methods of applying electric apparatus to handling problems of such plants.

Use of Electric Industrial Trucks. Textile World Jl., vol. 56, no. 17, Nov. 29, 1919, pp. 111-113, 6 figs. Illustrating uses of tractors provided with safety devices, which permit employment of women workers.

What Electric Industrial Truck Will Suit Your Needs, F. A. Pope. Factory, vol. 24, no. 11, June 15, 1920, pp. 1890-1894, 12 figs. Writer suggests possibilities of application of electric industrial truck and calls attention to some features of various types which affect their proper selection.

Foundries. See FOUNDRIES, Industrial Trucks for.

Interdepartmental Trucking. Using Basements and Subways for Factory Trucking, Peter F. O'Shea. Factory, vol. 23, no. 6, Dec. 1919, pp. 1285-1289, 6 figs. System of Fisk Rubber Co. for fast trucking between departments and between buildings.

Lifting. See Belmont.

Types. Inter- and Intra-Departmental Handling of Material at the Holt Plant. Metal Trades, vol. 10, no. 11, Nov. 1919, pp. 491-493, 6 figs. Types of truck used around wharves, warehouses, etc.

INDUSTRIES

Japan. Industrial Prospects in Japan. Eng., vol. 110, no. 2854, Sept. 10, 1920, pp. 351. Development of Japanese industries during the war. From report on Commercial, Industrial and Financial Situation of Japan, 1914-1919, published by British Government.

Socialization of. A German Industrialist's Views on Socialisation, Felix Deutsch. Eng., vol. 109, nos. 2838 and 2839, May 21 and 28, 1920, pp. 703-704 and 734-735. Facts and figures are presented which, it is claimed, demonstrate "that exaggerated demands by employees and workmen cannot bring them any benefit, but may in a measurable distance of time bring our (German) industry to a standstill, and themselves to unemployment."

INFLAMMABLE MATERIALS

Liquids, Storing of. A Method for Storing and

Handling Inflammable Liquids (Ein neues Lagerund Förderverfahren für feuergefährliche Flüssigkeiten), Georg Urff. Automobil-Rundschau, vol. 19, no. 11-12, June 1920, pp. 113-115, 2 figs. Describes apparatus with motor-drum pump for the continuous supply of a given quantity of liquid.

INJECTORS

Boiler Feedwater. Hot-Water Feeding for Boilers (Kesselspeisung mit heissem Wasser), A. Bruser. Kraft und Betrieb, vol. 3, nos. 9 and 10, Aug. 1 and 15, pp. 114-115 and 121-122, 4 figs. Treatise on principles and application of injectors for feedwater of 30 deg. without addition of cold water and for feedwater of maximum heat of 100 deg. cent. with addition of cold water. Description of "hot-water" injector.

INKS

Manufacture. Inks—Their Composition, Manufacture, and Methods of Testing. Dept. of Commerce, Bureau of Standards, Circular no. 95, June 28, 1920, 24 pp. Composition and manufacture of various inks, together with analyses of them.

INLAND WATERWAYS

Automotive Shipments. Water Borne Transportation for Automotive Shipments, George E. Quisenberry. Automotive Industries, vol. 43, no. 1, July 1, 1920, pp. 28-30, 1 fig. Survey of possibilities of such transportation based upon experience of several companies.

Illinois. Inland Waterway Transportation, Theodore Brent. Jl. Western Soc. Engrs., vol. 24, no. 6, June 1919, pp. 359-364 and (discussion) pp. 364-374. Argument in favor of building Illinois Waterway.

Light-Draft Craft. Craft for Canal and River Service in the United States. Engr., vol. 129, no. 3363, June 11, 1920, pp. 593-596, 6 figs. Towing-boat constructed for Alabama waterways, and steel towing-boat for Mississippi River service, also steel barge for New York State barge canal system.

Size of, Determination. Determination of the Dimensions of Large Ships Intended for Inland Navigation, and of the Size to be Given to Inland Waterways (Détermination des dimensions des bateaux de navigation intérieure de fort tonnage, et du gabarit des voies navigables), Annales des Ponts et Chaussées, vol. 55, no. 2, March-April 1920, pp. 169-192. Study of comparative economy of carrying traffic in large ships and in barges. It is found that larger ships and waterways are more economical when traffic is in excess of 300,000 tons per year. Memoir prepared by Committee appointed by French Ministry of Public Works.

Transportation, Future of. What Is the Future of Inland Water Transportation? Charles Whiting Baker. Eng. News-Rec., vol. 84, nos. 1-5, Jan. 1, 8, 15, 22 and 29, 1920, pp. 19-28, 85-89, 137-144, 184-199, 234-242. Economic condition of inland water transportation is studied, field which it should occupy with relation to railway transport is pointed out, and conclusions are drawn in regard to policy which it is believed should be adopted with reference to waterway development.

Transportation Rates. Influence of Capacity of Ships Upon Transportation Rates in Canals (Influence de la capacité des bateaux sur les frais de transports par canaux), M. Galliot. Annales des Ponts et Chaussées, vol. 54, no. 1, Jan.-Feb. 1920, pp. 39-61. Procedure is suggested for calculating most economical tonnage for ships operating in canal in terms of total cost of construction, operation and maintenance of canal, total traffic it carries, etc.

[See also CANALS; RIVERS.]

INSPECTION

Factory. Inspection and the Modern Factory, O. B. Whittaker. Am. Mach., vol. 53, no. 7, Aug. 12, 1920, pp. 305-309, 6 figs. Organization of inspection department.

Optical Methods for. Optical Aids for the Engineer, R. J. Whibley. Machy. (Lond.), vol. 15, no. 380, Jan. 8, 1920, pp. 451-459, 18 figs. Optical methods that have been developed at National Physical Laboratory, Teddington, England, for aiding inspection work in metrology department.

INSULATING MATERIALS

Forming Articles from. Tools for the Manufacture of Formed Articles from Insulating Materials (Werkzeuge zur Herstellung von Formstücken aus Isoliermaterial), R. Stock. Werkstattstechnik, vol. 14, no. 1, Jan. 1, 1920, pp. 1-6, 60 figs. Notes on the various types of molds used for forming parts under hydraulic pressure.

Thermal Conductivity of. Thermal Conductivity of Insulating Materials, T. S. Taylor. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 8-10, 2 figs.; also Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 526-532, 6 figs. Experimental. "Thermal bridge" recommended by Prof. Northrup (Jl. Instn. of E. E., Lond., vol. 48, 1912, p. 674) was found satisfactory for determining thermal conductivity of sheet materials, while "thermal meters," one of circular cross-section and the other of square cross-section, were found entirely reliable for measurement of thermal conductivity of sheet and other materials. Table is included giving results of measurements of thermal conductivity for large number of materials both across and along laminations. It was found that by putting vaseline, glycerine, glue or shellac or similar material on division between two surfaces, thermal drop due to such division could largely be eliminated, especially in the case of poor conductors.

Volume Resistance of. Vacuum and Heat Treatment of Insulating Materials, J. E. Shrader. Elec. Jl., vol. 17, no. 4, Apr. 1920, pp. 157-160, 8 figs. It is pointed out that method ordinarily employed in measuring volume resistance of insulating materials is to make measurements between mercury electrodes provided with a guard ring, but this method is not suitable during vacuum and heat treatment because of evaporation of mercury; therefore, finely powdered graphite was tried for making contact between brass electrodes and the specimen, and this method, it is claimed, proved not only suitable but better than mercury contact.

[See also DIELECTRICS.]

INSULATION

Heat. See WALLS, Heat Insulation of.

Testing. Apparatus for Testing Insulation (Isolationsprüfer). Elektrotechnischer Anzeiger, vol. 36, no. 77, July 27, 1919, pp. 357-358, 4 figs. Illustrating various types of testing apparatus.

INSULATORS, ELECTRIC

Failure Elimination. Elimination of Insulator Failures, E. J. Kallevang. Elec. World, vol. 74, no. 20, Dec. 13, 1919, pp. 1063-1064. Results of tests and experience with insulators on transmission lines in Wisconsin.

High-Tension. Causes of Breakage in High-Tension Insulators, E. O. Meyer. Elecn., vol. 83, no. 2162, Oct. 24, 1919, pp. 466-467. Examination of breakages occurring frequently in transmission line in Germany claimed to have discovered that cause of cracking lay in co-

menting process by which parts of insulators were joined together. Translated from Elektrotechnische Zeitschrift, nos. 16, 17, 18 and 24, 1919.

Changing Insulators on Live Lines. Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 992-994, 12 figs. Insulating frame used to raise and hold high-tension line conductors above top of pole so that insulators and cross-arms can be replaced with ease. Lifting tools and other devices aid in tying wires to insulators.

High-Tension Insulator Porcelain, W. D. A. Peaslee. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 5, May 1920, pp. 445-448, 2 figs. Qualities which porcelain used in manufacture of high-tension insulators must have. With improvement in the development of porcelain bodies, commercial production in insulator form of such bodies may soon come.

Phenomena Causing Rupture of High-Tension Insulators (Phénomènes provoquant la mise hors service des isolateurs à haute tension), E. O. Mayer. Revue générale de l'Électricité, vol. 6, no. 18, Nov. 1, 1919, pp. 608-609, 3 figs. Factors which influence formation of fissures. Translated from Elektrotechnische Zeitschrift.

Researches in High-Voltage Insulation, Harris J. Ryan. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 253-256, 4 figs. Tests of suspension insulators at Leland Stanford Jr. University are said to have shown that temperature changes are most serious causes of failure.

Line Tests for. Present and Future of Line Insulators, F. W. Peek, Jr. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 209-211, 4 figs. Failure is attributed to expansion of metal parts, cement, etc. It is believed that combined electrical, mechanical and porosity test should be substituted for present tests.

Paper Tubes. The Manufacture of Insulating Tubes and Accessory Parts (Herstellung von Isolierrohren und Zubehörteilen), R. Stock. Werkstattstechnik, vol. 14, nos. 4 and 5, Feb. 15 and Mar. 1, 1920, pp. 97-100 and 146-151, 122 figs. Details of an automatic roller-cuting machine for cutting paper rolls from which the insulating tubes are made; tube-molding machines for flexible tubes; revolving paper roll holder attached to molding machine for manufacture of spiral tubes; method and device used for impregnating tubes, etc. Sectional diagram of plant for manufacture of insulating tubes is shown.

Porcelain. A Shrinkage Method for Fastening Bodies in the Hollow Spaces of Porcelain Articles, in Particular for the Manufacture of Insulators Consisting of Two or More Parts. (Verfahren zum Befestigen von Körpern in Hohlräumen von Porzellangegenständen insbesondere zur Herstellung zwei-oder mehrteiliger Isolatoren durch Abschrumpfen). Ziegelwelt, vol. 50, no. 79, Oct. 18, 1919, p. 483, 1 fig. Description of process patented by H. Schomburg & Sons, Grossdubrau, Saxony.

Porcelain Insulators (Les isalateurs en porcelaine), O. Boudouard. Revue générale de l'Électricité, vol. 7, no. 21, May 22, 1920, pp. 691-696. Results of chemical analyses of insulators made in England, France, Germany and United States. Report presented to Union of Electrical Syndicates.

Surface Leakage. Surface Leakage as a Factor in Insulator Design, T. M. Feder. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 9, Sept. 1920, pp. 803-806, 7 figs. Discusses various factors influencing surface resistance and methods of increasing it. Typical computations are given, showing approximate increase to be expected when corrugations are added.

Suspension. Electrical Characteristics of the Suspension Insulator, F. W. Peek, Jr. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 623-630, 23 figs. Duties of line insulators at voltages above 100 kv. are reviewed and compared with duties imposed by lower voltages.

Factors Controlling the Design and Selection of Suspension Insulators, W. D. A. Peaslee. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 571-579, 10 figs. Discussion of factors entering into design and operating behavior of suspension insulators and problems to be solved in designing suspension insulator to overcome objectionable features shown by experience to affect seriously operation of insulators in service. Factors to be taken into consideration in selection of suspension insulators for given condition are given and brief discussion of general trend of future improvements is presented.

The Designing and Testing of Suspension Insulators. A New Type of Insulator (Sulle caratteristiche e sulle prove degl isolatori. sospesi. Nuovo tipo di isolatore), P. G. Venturini. Elettrotecnica, vol. 7, no. 11, Apr. 15, 1920, pp. 174-178, 10 figs. Porcelain insulator developed by writer from technical study of characteristics of such insulators, and from results of experimental work. Insulator is manufactured by Società Ceramica Richard-Ginori.

Unit Voltage Duties in Long Suspension Insulators, Harris J. Ryan and Henry H. Henline. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 631-636, 21 figs. Potentiometer measurements were made of maximum and average voltage duties occurring in strings made up of 10-in. cap and pin type units wherein numbers of units were varied from 2 to 20. It is concluded that suspension insulator units in common use can be satisfactorily employed for make-up of insulators for 250-kv. lines, and that static shields in requisite forms will lower maximum unit voltage duties so as to permit satisfactory insulation of lines for use of voltages far above 150 kv.

Testing. An Analysis of Insulator Practice. Elec. World, vol. 75, nos. 11, 12 and 13, Mar. 6, 13 and 20, 1920, pp. 543-546, 597-600, and 673-675. Reports from more than 40 transmission companies quoting their experience in regard to nature, frequency and expense of tests and inspection, and observed causes of failure; types and ratings of insulators; forms used for reporting.

INSULATORS, HEAT

Form vs. Heat Transfer. The Effect of Geometrical Form upon the Heat Transfer Through Insulation, C. E. Rose. Ice & Refrigeration, vol. 59, no. 3, Sept. 1920, pp. 82-84, 4 figs. Analytical methods for computing insulation in three cases, (1) cork board on plain surface, (2) circular pipe insulated with cylinder of insulation, and (3) circular pipe enclosed in square of insulation.

Thermal Conductivity of. The Thermal Conductivity of Solid Insulators, W. M. Thornton. Lond., Edinburgh & Dublin Phil Mag., vol. 38, no. 228, Dec. 1919, pp. 705-707. It is concluded from examination of properties of various insulators that "chief practical qualification of a material as a heat insulator is that it should be light and inelastic."

See also INSULATING MATERIALS, Thermal Conductivity of.

Thickness Required. Heat Insulation. Power Plant Eng., vol. 24, no. 10, May 15, 1920, pp. 514-516, 1 fig. Diagram for finding correct thickness of various insulating materials.

[See also COLUMNS, Fire-Resistive.]

INSURANCE

Industrial. Group Insurance as Employees' Service, Edward E. Rice. Indus. Management, vol. 59, no. 6, June 1920, pp. 449-453. Group disability insurance, group life insurance, and group annuities, are separately described and limitations of each pointed out. A combination of these is suggested as system of protection for industrial workers, in which they and their employers coöperate.

Knowing Your Insurance Policy, Chesla C. Sherlock. Am. Mach., vol. 52, nos. 20, 21, 24, May 13, 20, June 10, 1920, pp. 1035-1037, 1084-1086, 1244-1246, and vol. 53, no. 1, July 1, 1920, pp. 25-27. May 13: Conditions necessary for insurable interest. May 20: Method of payment of premiums, particularly in regard to question of promissory notes. June 10: Effect of representations and warranties or their breach upon contract of insurance. July 1: Tells why policy should contain definite statements about cancellation, and explains rights of insurer and of insured in event of attempted cancellation of insurance policy by either one.

[See also MORTALITY TABLES.]

INTEGRALS

Dirichlet's Oscillating. Asymptotic Formulæ for Oscillating Dirichlet's Integrals and Coefficients of Power Series, Zotoji Kunieda. Jl. College Sci., Imperial Univ. of Tokyo, vol. 41, art. 4, Apr. 30, 1919, 101 pp., 1 fig. Formulæ are worked out for cases noted by G. H. Hardy in Quarterly Jl., vol. 44, pp. 1-40 and 242-263.

Electromagnetic. Electromagnetic Integrals, G. Greenhill. Philosophical Trans. of Royal Soc. of Lond., series A, vol. 220, pp. 35-65, 4 figs. Attempt to revise and simplify mathematical treatment required in calculations of elliptic integrals of first, second and third kind arising in practical problem of measurement and determination of electrical units, and to reconcile notations and results of various writers, Viriamu Jones, G. M. Minchin, and others, and to standardize them in accordance with Maxwell's Electricity and Magnetism.

INTEGRAPH

See EXCAVATION, EARTH, Calculations.

INTERCHANGEABLE MANUFACTURE

Drawings for. Component Drawings for Interchangeable Manufacture, Earle Buckingham. Machy. (N. Y.), vol. 26, nos. 3, 4 and 5, Nov., Dec. 1919 and Jan. 1920, pp. 259-263, 332-336 and 438-442, 39 figs.; also Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 417-421, 18 figs. Methods of dimensioning drawings and indicating tolerances.

Economical Practice in. Economical Interchangeable Manufacturing Practice, Earle Buckingham. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 636-641. Deals with specifications and their use in interchangeable manufacture, use of general and specific production data, and factors entering into production costs.

Equipment. Equipment for Interchangeable Manufacturing, Earle Buckingham. Machy. (N. Y.), vol. 26, nos. 8 and 9, Apr. and May, 1920, pp. 754-760 and 828-833, 32 figs.; also Machy. (Lond.), vol. 16, nos. 403, 406 and 408, June 17, July 8 and 22, 1920, pp. 323-329, 421-426 and 495-499, 48 figs. Discussion of principles to be considered in selection of machine tools and in designing jigs, fixtures and cutting tools for interchangeable manufacture. Description of jigs used in machining an automobile transmission case, and other examples.

Gages for. See GAGES, Interchangeable Manufacture.

Inspection and Testing. Inspection and Testing in Interchangeable Manufacture, Earle Buckingham. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 52-54. Principles involved in inspection of interchangeable parts and duties of inspection department.

Jigs. Equipment for Interchangeable Manufacturing, Earle Buckingham. Machy. (N. Y.), vol. 26, no. 10, June 1920, pp. 927-932, 16 figs. Jigs used in machining an automobile transmission case, and other examples illustrating principles that should be applied in designing manufacturing equipment.

Methods. Manufacturing for Selective Assembly, Earle Buckingham. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 142-143. Comparison of interchangeable and selective assembly manufacturing methods. Dimensions and tolerances on drawings for manufacturing on selective assembly basis.

Standardized Gages for. Standardized Gauges for Interchangeable Manufacture—I. Machy. (Lond.), vol. 15, no. 383, Jan. 29, 1920, pp. 547-551, 9 figs. Explains modern inspection-department practice and principles of gage design, including tolerance system for gages, designed especially for interchangeable manufacture.

[See also MANUFACTURING, Component-Part System of; STANDARDS, Standard Shafts vs. Standard Holes.]

INTERFEROMETERS

Gas. Application of the Interferometer to Gas Analysis, Junius David Edwards. Chem. & Metallurgical Eng., vol. 21, no. 11, Oct. 29 and Nov. 5, 1919, pp. 560-565. Principle of gas interferometer and its method of use in gas analysis are discussed in connection with calibration of instrument. Effect produced upon observations by variations in composition and experimental conditions is analyzed and equations are developed by which magnitude of such changes can be estimated. Typical cases in which interferometer may be employed are given.

INTERNAL-COMBUSTION ENGINES

Air Filter. Air Filter for Internal-Combustion Engines (Luftfilter für Explosionsmotoren), Schmidt-Reinhau. Oel- u. Gasmaschine, vol. 17, no. 4, Apr. 1920, pp. 49-51, 2 figs. Details of the Radio air filter (Radio Apparatus Co., Ltd., Berlin), designed for economy of space in connection with its use on agricultural motor plows, which is filled with especially constructed metal rings, and has a filter surface 500 times larger than a cloth or wire filter of same size.

Automotive Industry and. The Internal-Combustion Engine as Developed by the Automotive Industry, J. G. Vincent. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 235-256, 26 figs. Historical and descriptive account.

Carburetors. See CARBURETORS.

Central-Station Power vs. Internal Combustion Engines vs. Central Station Power, R. E. Fisher, W. W. Shuhaw and Clayton Ingalls. Jl. Electricity, vol. 44, no. 8, Apr. 15, 1920, pp. 353-355. It is stated that central-station service is more reliable than that obtained with internal-combustion engine with its worry, troubles and responsibilities. Paper read before Nat. Elec. Light Assn. Convention.

Combustion Phenomena. The Combustion Phenomena in Internal Combustion Engines: Exhaust, Gas Analysis and Heat Balance (Die Verbrennungsvorgänge im Explosionsmotor Auspuffgasanalyse und Wärmebilanz), F. Wirth. Automobil-Rundschau, vol. 19, nos. 7-8, 9-10, 11-12 and 13-14, Apr., May, June and July.

1920, pp. 66-69, 84-89, 104-108 and 126-130. Equations and tables for calculation of required air and oxygen, and laws governing combustion phenomena. States that combustion is most complete and heat losses are least when explosion motor works with advanced ignition. Formulas and methods for calculating loss of heat in engine through exhaust gases, sensible heat of exhaust gases, etc. Notes on combustion temperature and speed; suggestions for improvements of combustion engines; bibliography.

Cylinder Lubrication. See LUBRICANTS, Engine, Dilution by Fuel.

Design. Overhead Valves and Fuel Economy, F. M. Green. Autocar, vol. 45, no. 1289, July 3, 1920, pp. 11-13, 3 figs. Reply to arguments advanced in favor of side valves by H. R. Ricardo in his article on Fuel Economy and Engine Design, published in Autocar, June 19, 1920, p. 1135.

Developments. Progress in the Field of Internal-Combustion Engines (Neuerungen auf dem Gebiete der Verbrennungskraftmaschine), Wirtschaftsmotor, nos. 2 and 3, Feb. and Mar., 1920, pp. 25-27 and 23-24, 28 figs. Details of device for cooling ports in 2-stroke internal-combustion engine; method of operation patented by the Berlin Construction Co., Ltd., by means of which greater power is obtained; new form of exhaust conduit for 2-stroke engines; by H. Baer, Breslau; new 2-stroke engine of H. Ganthier, Liege, Belgium; Daimler engine with three rows of cylinders; a combined starting and fuel valve of F. Krupp Corp., Kiel, etc.

The Development of the Internal Combustion Engine, Charles Baxter. Trans. Inst. Mar. Engrs., vol. 31, no. 248, 1919-1920, pp. 437-505, 77 figs. With formulæ used in design, tables of tolerances for various fits, sketches illustrating individual characteristics of principal types, etc.

Efficiency Determination. See CARBON DIOXIDE, Adiabatic at High Temperatures.

Fan Brakes for Testing. Fan Brakes for Automobile, Boat and Other Small Engines (Bremsflügel für Automobil-, Boots- und andere Kleinmotoren), Fritz Müller. Motorwagen, vol. 23, no. 12, Apr. 30, 1920, pp. 193-195, 5 figs. Describes fan brakes used during war for the quick measurement of capacity of aerial motors, pointing out that smaller brakes of same type can be used advantageously for the brake testing of automobile, boat and other small engines.

Flame Propagation in Cylinders. See FLAME PROPAGATION, Engine Cylinders.

Fuel-Consumption Measurement. A New Type of Fuel- and Oil-Consumption Measurement (Eine neuartige Brennstoff- und Oelverbrauchsmessung), K. Fr. Nägele. Oel- u. Gasmaschine, vol. 17, no. 7, July 1920, pp. 99-102, 8 figs. Details of the Seppeler sampling apparatus by use of which it is possible from samples to determine quickly, simply and accurately amount of fuel consumed.

German Submarines. The Motors of the German Submarines (Les moteurs des sousmarins allemands), H. Tastet and F. Bégue. Technique Moderne, vol. 12, no. 5, May 1920, pp. 204-212, 16 figs. Characteristics: Number of cylinders, 6; dimensions of cylinders, 500 mm. stroke by 450 mm. diameter; total power, 1650 hp.; total length of machine, 11 meters; width, 1.074 meters; height, 2.407 meters. Built by Germania-Krupp Works.

Ignition. See IGNITION.

Low-Temperature Cycle for. A Low Temperature Cycle for Large Internal Combustion Engines, J. R. Kingston. Engr., vol. 130, no. 3372, Aug. 13, 1920, pp. 164-165, 3 figs. Suggests adopting thermodynamic cycle having adiabatic compression and expansion.

Lubrication. Lubrication of Internal-Combustion Engines, W. F. Osborne. Power, vol. 51, no. 15, Apr. 13, 1920, pp. 590-593. Deals with various construction and operating conditions which affect choice of oil for internal-combustion engines. List of lubricating troubles is given, together with causes of each.

Tests of Lubricants for the Internal Combustion Engine, Fred C. Ziesenheim. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 960-962, 1 fig. Outline of method of testing engine with different kinds of oil and manner of determining which is best suited for particular conditions under which engine is intended to operate.

The Lubrication of Internal-Combustion Engines (Zur Schmierung der Verbrennungkraftmaschinen), H. Praetorius. Motorwagen, vol. 23, no. 20, July 20, 1920, pp. 365-370, 12 figs. Description of a number of patented lubrication systems and devices of well-known German and Austrian firms.

See also Cylinder Lubrication.

Manufacture. A Modern Gas & Oil Engine Works. Eng. Production, vol. 1, no. 6, June 1920, pp. 227-231, 16 figs. Organization and methods of Crossley Bros., Ltd., England. Engines manufactured range from 3 to 3000 b.hp.

Marine. Specifications of Marine Motors. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 199-209. Tables compiled from reports of manufacturers to end of 1919.

See also MARINE ENGINES.

Olympia Show. Marine and Stationary Engines at Olympia. Auto, vol. 25, no. 11, March 11, 1920, pp. 280-283, 11 figs. Review of engines, accessories and items exhibited at Olympia International Motor-Boat and Marine and Stationary Engine Show.

Motor Boat and Marine and Stationary Engine Exhibition. Automobile Engr., vol. 10, no. 137, April 1920, pp. 155-156, 6 figs. Also article similarly entitled in Mar. Eng. & Naval Architect, vol. 42, no. 511, April 1920, pp. 260-262, and p. 272, 6 figs. Notes on types exhibited at Olympia Show.

Piston Cooling. Piston Cooling for Internal-Combustion Engines (Kolbenkühlung für Verbrennungsmotoren), W. Schlachter. Schiffbau, vol. 21, no. 34, July 14, 1920, pp. 925-931, 7 figs. For a better oversight of conditions governing maintenance of permissible temperatures in pistons, the heating of piston by the burning gases and the radiation of heat from the cylinder are investigated and approximate calculations made.

Pratt. New Universal Type of Heat Engine. Can. Engr., vol. 39, no. 10, Sept. 2, 1920, pp. 310-311 and p. 313, 3 figs. Internal-combustion engine invented by G. R. Pratt of Winnipeg, Canada. Combustion takes place in chamber separate from cylinders, and displacer delivers charges of air and hot gases. Lump or powdered coal is used as fuel in a furnace or producer.

Progress in 1919. Internal Combustion Engine Progress in 1919. Gas & Oil Power, vol. 15, no. 172, Jan. 1, 1920, pp. 57-58. Progress is seen to have consisted principally in standardization of gas and oil engines.

Radial. The Possibilities of the Radial Engine, J. B. Swan. Automobile Engr., vol. 11, no. 141, Aug. 1920, pp. 306-310. After viewing possibilities of radial engines, opinion is expressed that (1) as regards installation, radial engine has distinct drawbacks for all uses except tractors and aircraft, and (2) as regards manufacture, radial engine is far more expensive to produce than vertical engine, and very little cheaper than V-type.

Research. A High Speed Internal Combustion Engine for Research, H. R. Ricardo. Eng., vol. 110, nos. 2853 and 2854, Sept. 3 and Sept. 10, 1920, pp. 325-330 and 361-362, 13 figs. Sept. 3: Single cylinder unit of 4½-in. bore and 8-in. stroke, fitted with special arrangements to provide for varying ratio of compression in shortest possible time while engine is running on full load, and design to run for long periods at piston speeds of from 2000 to 3000 ft. per min.; Sept. 10: Experiments of efficiency at reduced loads, with varying compression, effect of ignition and effect of inlet temperature. Paper read before Eng. Section, British Assn. for Advancement of Science.

Spark Plugs. See SPARK PLUGS.

Special Design. Rational Utilization of Natural Forces (L'utilisation rationnelle des forces naturelles), L. Pierre-Guedon. Génie Civil, vol. 76, no. 7, Feb. 14, 1920, pp. 178-180, 3 figs. Design of internal-combustion engine is suggested having two cylinders communicating by large orifice, one having twice the volume of the other, the larger drawing and compressing pure air. Piston of larger cylinder closes orifice during explosion in smaller cylinder, but communication is immediately reëstablished and at end of common stroke there is equilibrium of pressure and temperature in both cylinders. Larger cylinder can also operate as explosion cylinder.

Specific Heat of Working Fluid. Specific Heat and Dissociation in Internal-Combustion Engines, H. T. Tizard and D. R. Pye. Eng., vol. 110, no. 2853, Sept. 3, 1920, p. 325. Table giving dissociation of carbon dioxide and water at different temperatures and pressures. (Abstract.) Paper read before Eng. Section, British Assn. for Advancement of Science.

The Specific Heat of the Working Fluid in Internal-Combustion Engines, D. R. Pye. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 57-59, 1 fig. Summary of articles published in Germany between 1910 and 1912 giving results of work on specific heats of a number of gases up to temperatures as high as 3000 deg. cent.

Testing Plant. A Modern Testing Station. Automobile Engr., vol. 10, no. 137, April 1920, pp. 134-138, 14 figs. Research works of Messrs. Ricardo & Co., Engineers, Ltd., England, for internal-combustion engine investigations.

Valve Springs. Valve Springs for Internal-Combustion Engines, R. E. Mathot. Gas Engine, vol. 22, no. 7, July 1920, pp. 206-208, 2 figs.; also Gas & Oil Power, vol. 15, no. 177, June 3, 1920, pp. 139-141. Table for determining dimensions.

Valves. Accidents to Valves in Internal-Combustion Engines, and Steel to Use for These Valves (Pannes de soupapes et aciers à soupapes dans les moteurs à explosions), G. Gabriel. Technique Automobile et Aérienne, vol. 10, no. 110, 1920, pp. 69-82, 7 figs. Qualities which should be possessed by steel to withstand stresses to which valves are subjected are determined, steels being used for valve manufacture are surveyed, and suggestions are given as to more systematic selection of such steels.

Materials for the Exhaust Valves of Internal-Combustion Engines, J. E. Hurst and Harold Moore. Engineering, vol. 108, no. 2812, Nov. 21, 1919, pp. 672-674. Specifications for various materials employed in manufacture of exhaust valves. Based principally on reports of Air Board.

Valve Failures and Valve Steels in Internal-Combustion Engines, Leslie Aitchison. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 401-410, 13 figs.; also Iron & Coal Trades Rev., vol. 99, no. 2698, Nov. 14, 1919, pp. 626-627. Troubles are codified as (1) elongation of stem, (2) distortion of head, (3) cracks in face, (4) excessive wear of stem or (5) of valve foot, (6) burning out of head, (7) scaling, and (8) breaking of head or neck due to self-hardening. Metallurgical significance of each of these is discussed and attempt is made to draw out properties which steel must possess in order to withstand these probable failures.

[See also AEROPLANE ENGINES; ALCOHOL ENGINES; AUTOMOBILE ENGINES; DIESEL ENGINES; GAS ENGINES; GASOLINE ENGINES; HEAVY-OIL ENGINES; IGNITION; KEROSENE ENGINES; MARINE ENGINES, Heavy-Oil; Still vs. Sulzer; MOTOR TRUCKS, Engines; MOTORBOATS, Olympia Show; OIL ENGINES; SEMI-DIESEL ENGINES; TRACTOR ENGINES.]

INTERURBAN RAILWAYS

See STREET RAILWAYS.

INVAR

See NICKEL STEEL, Invar.

INVENTION

Encouragement of. Encouragement of Invention in Workshop Practice, J. Hamilton Gibson. Trans. Inst. Marine Engrs., vol. 32, April 1920, pp. 1-18 and (discussion) pp. 18-34, 14 figs. Also Eng., vol. 109, no. 2838, May 21, 1920, pp. 700-702, 18 figs. Outlines scheme of cooperation between firm and workman inventor for patenting and exploiting inventions.

INVENTIONS

See MECHANICAL SCIENCE.

INVESTMENT

Economic Limits in. Determining Limits of Legitimate Capital Expenditure, J. R. Wade. Eng. News-Rec., vol. 85, no. 8, Aug. 19, 1920, pp. 358-359, 2 figs. Chart indicating relation of variable interest charges and operating expenses to maximum economy, constructed for determining limits of useful capital expenditure for any engineering work or program of industrial expansion.

IONIC VALVES

Oscillations. Further Experiments on the Variation of Wave-Length of the Oscillations Generated by an Ionic Valve due to Changes in Filament Current, J. H. Vincent. Proc. Roy. Soc., series A, vol. 97, no. A683, April 15, 1920, pp. 191-196. Incidences of maximum wave-length for particular current is claimed to have been established.

[See also VACUUM TUBES.]

IONIZATION

Freezing Point Lowered by. The Degree of Ionization of Very Dilute Electrolytes, Gilbert N. Lewis and George A. Linhart. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1951-1960, 3 figs. A general equation for freezing-point lowering of dilute strong electrolytes is developed.

Gases. Ionization Potentials of Argon, Nitrogen, Carbon Monoxide, Helium, Hydrogen and Mercury and Iodine Vapors, Clifton G. Found. Physical Rev., vol. 16, no. 1, July 1920, pp. 41-53, 8 figs. Measurement of ionization potential of gases was accomplished by means of two-electrode tube, by determining point of current-voltage curve at which current increases at rate faster than that required by Langmuir's equation.

See also GASES, Ionization of.

Largely Ionized Substances. The Ionization and Activity of Largely Ionized Substances, Arthur A. Noyes and Duncan A. MacInnes. Jl. Am. Chem. Soc., vol. 42, no. 2, Feb. 1920, pp. 239-245. Table presenting results which are summarized as follows: (1) In case of all four substances activity coefficient decreases with increasing concentration much more rapidly than does conductance-viscosity ratio; (2) in case of all substances except potassium chloride the activity coefficient passes through pronounced minimum in neighborhood of 0.5 molal; (3) activity coefficient even at moderate concentrations varies considerably with nature of substance.

Partial. Radiation Produced by Partial Ionization, C. D. Child. Physical Rev., vol. 15, no. 1, Jan. 1920, pp. 30-37, 1 fig. Different cases are discussed and explanation suggested based on Bohr's assumption that radiation occurs when an electron falls from an outer to an inner orbit, combined with assumption that complete ionization is produced much less frequently than partial ionization, that is, displacement of an electron from an orbit to one farther out.

Theory of. On the Theory of Ionization by Collision, P. O. Pedersen. Lond., Edinburgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 325, July 1920, pp. 129-137, 6 figs. Writer refers to assumptions by N. R. Campbell in article in this journal (vol. 23, 1912, p. 400) and claims he does not give exact solution, but claims exact solution, deduction of which is given, is quite simple and may be given a form to which Townsend's measurements may easily be applied, which is not true of the Campbell formula.

IONS

Activity Coefficient of. The Activity Coefficient of Ions (Der Aktivitätskoeffizient der Ionen), N. Bjerrum. Zeitschrift für anorganische u. allgemeine Chemie, vol. 109, no. 3-4, Jan. 16, 1920, pp. 275-292, 1 fig. Writer seeks to calculate the hydration of certain ions and electrolytes, starting with a given coefficient which indicates the influence of active forces between the ions on activity of the ions. Report from the chem. laboratory of the Agricultural High School of Copenhagen.

Electrolytic, Theory of. The Theory of Electrolytic Ions—XIII (Beiträge zur Theorie der elektrolytischen Ionen), Richard Lorenz. Zeitschrift für anorganische u. allgemeine Chemie, vol. 109, no. 1, Dec. 11, 1919, pp. 63-68. Supplementary and explanatory notes to author's previous article with above title in same journal (vol. 106, no. 10, 1919) dealing with conductivity of multivalent and multi-stage electrolytes. Report from the Inst. for Physical Chemistry of the University of Frankfurt to the Physical Soc.

IRON

Aging of. See Brittleness.

Alloys, Magnetic Properties of. The Dependence of Magnetic Properties, Specific Resistance and Density of Iron Alloys on the Chemical Composition and Thermic Treatment (Ueber die Abhängigkeit der magnetischen Eigenschaften, des spezifischen Widerstandes und der Dichte der Eisenlegierungen von der chemischen Zusammensetzung und der thermischen Behandlung), E. Gumlich. Elektrotechnische Zeitschrift, vol. 40, no. 30, July 24, 1919, pp. 361-363, 9 figs. Thermic treatment and magnetic measurements. Magnetic properties after slow cooling and after plunging. Photomicrographs.

Atomic Weight of. The Atomic Weight of Iron (Ueber das Atomgewicht des Eisens), Alois Bilecki. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 4, Oct. 24, 1919, pp. 318-320. Results of analyses are given in tabular form. The same phenomenon is said to occur as with manganese, namely, that figures derived from oxide are higher throughout than those derived from analysis of bromide to the extent of about 1/900 of the value; which goes to prove, it is concluded, that atomic weights of bromium and silver employed by Richards school give a more correct expression of their relation to oxygen than international table of atomic weights.

Behavior in Sulphuric Acid. Experiments on the Behaviour of Iron in Contact with Sulphuric Acid, C. E. Fawsitt and A. A. Pain. Jl. & Proc. Roy. Soc. New South Wales, for 1918, vol. 52, pp. 396-405. Comparison of iron in concentrated sulphuric acid with passive iron, and variation in rate of action according to concentrations of acid.

Brittleness. The Brittleness at Blue Heat and the "Aging" of Iron (Ueber die Blaubrüchigkeit und das Altern des eisens), H. Wetzel. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 1, Aug. 1919, pp. 43-48, 5 figs. Results of various experiments are described and are said to show that relationship exists between the brittleness at blue heat and the so-called "aging" of iron, and that both phenomena are characteristically similar peculiarities of iron.

Carbon Determination. Carbon in Iron, T. D. Yensen. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 4, pp. 43-58, 2 figs. In order to eliminate errors due to absorption and weighing in ordinary method of determining carbon in iron and steel, it is suggested to freeze out CO_2 with liquid air and allow it to expand into volume, noting increase in pressure. Differentiation between absorbed carbon and that existing in combined form is effected by making two heatings, one to 600 deg. cent. in vacuo and other to 1000 deg. cent. or higher in oxygen.

Castings. See IRON CASTINGS.

Corrosion. Experiments on the Corrosion of Iron and Steel, William D. Richardson. Chem. & Metallurgical Eng., vol. 23, no. 6, Aug. 11, 1920, pp. 243-250, 2 figs. Corrosion losses on 24 different kinds of iron and steel were recorded for test period of 1000 days' immersion in air and brine, quiet and air agitated, with or without periodical drying. From paper read before Inst. of Chem. Engrs.

Protective Metallic Coatings for the Rust-proofing of Iron and Steel. Circular Bur. Stand., Dept. Commerce, no. 80, Oct. 4, 1919, 34 pp., 17 figs. Study of nature of corrosion and principles underlying methods of preventing corrosion, together with description of types of coatings and methods of application.

Rusting of Iron and Steel in Concrete (Zur Frage der Rostsicherheit des Eisens im Beton), H. Amos. Beton u. Eisen, vol. 19, nos. 9-10, June 5, 1920, pp. 102-104, 1 fig. States that in the case of concrete without cracks, iron deeply embedded in concrete does not become rusted; in the case of concrete with cracks, danger of rust is directly dependent on condition of the iron when it is embedded, and on depth and size of cracks and resulting possibility of the penetration of moisture to the iron.

The Influence of Copper, Manganese and Chromium and Some of Their Combinations on the Corrosion of Iron and Steel, E. A. Richardson and L. T. Richardson. Gen. Meeting of Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 13, pp. 123-125, 6 figs.

Tests performed with steel, both free from and containing copper, and upon commercially pure iron, both free from and containing copper. It was found that steel rusts much faster than iron. Presence of copper, however, decreases corrosion of both iron and steel, but its action is more intense and pronounced in case of latter, so that for given amount of copper steel is actually more resistant to atmospheric corrosion than is corresponding copper-bearing iron.

See also Wrought, Corrosion of.

Electrical Resistivity. The Effect of Various Elements on the Electrical Resistivity of Iron, A. L. Norbury. Iron & Steel Inst., Paper 17, Annual Meeting, May 6 and 7, 1920, 19 pp., 2 figs. Résumé of most important papers on subject, up to and including that of Benedicks in 1902. It is shown that Benedicks' method of plotting resistivity values of quenched carbon steels on straight line and extrapolating to 7.6 microhms as resistivity of pure iron, cannot be considered as correct in view of results obtained by recent investigators, which give 9.9 microhms per centimetre cube as resistivity of pure iron at 20 deg. cent. Problem of calculating electrical resistivity of steel from its chemical composition is also briefly discussed.

Electrodeposition of. Electro-Deposition of Iron as Applied to Motor Vehicle Repair Work, B. H. Thomas. Practical Engr., vol. 61, no. 1734, May 20, 1920, pp. 248-249. Describes process of electro-deposition of iron instituted by author in a heavy motor repair shop, which, it is claimed, proved successful in building up those parts of a motor vehicle which are subject to wear. Paper read before Instn. Automobile Engrs.

Electrolytic. An Aspect of Electrolytic Iron Deposition, W. A. Macfadyen. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 98-126 and (discussion) pp. 127-133, 14 figs. on supp. plates. Describes work undertaken with view to obtaining data on which an industrial process could be built up for purpose of salving worn steel parts by electroplating them with iron. Results show that iron can be deposited direct on to steel, and subsequent heat treatment produces an adhesion of deposit to basic metal very much better than best attainable by simple plating, and the deposited iron is much tougher than before treating, although considerably softer.

Some Defects in Electro-Deposited Iron, W. E. Hughes. Iron & Steel Inst., Paper 5, Annual Meeting, May 6 and 7, 1920, 18 pp., 23 figs. It is concluded from experiments and observations that electrolytic iron is liable to suffer from a number of defects that may render its use dangerous, and make it unsuitable for engineering purposes without separate heat treatment. It is believed, however, that these defects arise from causes which can be largely eliminated by efficient control and conduct of deposition process. Electrolytic iron, it is claimed, cannot be taken as pure from starting point of research work.

Founding. See IRON FOUNDING.

Gases in. Determination of Gases in Iron (Die Bestim mungen der Gase im Eisen), P. Oberhofer and A. Beutell. Stahl und Eisen, vol. 39, no. 51, Dec. 18, 1919, pp. 1584-1590, 7 figs. Description of apparatus and method for determining gases. Review of literature on this subject and photomicrographs.

Hydrogen Penetration of. The Penetration of Iron by Hydrogen, T. S. Fuller. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 702-711. Results of tests made to determine effect of current, treatment of iron temperature, electrolyte, and surface coating on penetration of iron by nascent hydrogen. It was found that rate of penetration increases with increase in temperature and is greater for iron immersed in one per cent sulphuric acid than for iron-electrolyzed as cathode in similar solution. Coating iron with tin increases rate of penetration, while coating it with zinc or copper has opposite effect.

Lead-Coated. Lead Coated Iron, Charles Baskerville. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 152-154. Concerning use of lead and lead-antimony alloy as protective agents.

Magnet. See STEEL, Magnet.

Malleable. See MALLEABLE IRON.

Metallurgy. See IRON METALLURGY.

Microstructure. See STEEL, Microstructure.

Mines. See IRON MINES.

Ores. See IRON ORE.

Oxygen in, Determination. The Determination of Oxygen in Iron (Ueber die Bestmmung des Sauerstoffs im Eisen), P. Obeoffer and O. von Kiel. Stahl u. Eisen, vol. 40, no. 24, June 17, 1920, pp. 812-814, 1 fig. Results of tests before and after reduction are said to show that at higher reduction temperature (1150 deg.) more oxygen is determined than at 950 deg., but from values given, it is not evident whether total oxygen can be determined at this temperature.

Pig. See IRON, PIG.

Puddled, Manufacture of. Future Developments in Puddled Iron Manufacture, J. E. Fletcher. Iron & Coal Trades Rev., vol. 99, no. 2700, Nov. 28, 1919, pp. 691-694, 5 figs. Points out possibilities of improving grate and firebox and of providing efficient means for burning poor coals. Paper read before Staffordshire Iron & Steel Inst.

The Characteristics of Puddled Iron, J. E. Fletcher. Eng. & Indus. Management, vol. 2, no. 24, Dec. 11, 1919, pp. 739-741, 2 figs. Writer states that there is sound scientific reason for belief that mechanical puddling of metal at temperatures below melting point of borderland alloy between cast iron and steel (that containing about 2 per cent carbon) should be practically and economically possible. Paper read before Staffordshire Iron & Steel Inst.

Puddling Plant. New Plant Puddles Iron Mechanically. Iron Age, vol. 104, no. 22, Nov. 27, 1919, pp. 1053-1057, 12 figs. Lebanon Valley Iron & Steel Co. plant at Lebanon, Pa. Among advantages claimed for mechanical puddling is great saving of labor, which is reflected in reduced production cost. The whole plant, it is stated, with capacity for 160 tons of iron every 12 hr., will be manned by not more than 20 workers.

Reclamation from Non-Ferrous Materials. Reclaiming Iron from Non-Ferrous Materials, Hubert Hermann. Blast Furnace & Steel Plant, vol. 8, no. 8, Aug. 1920, pp. 442-445, 10 figs. Description of method of reclaiming iron from non-ferrous materials for remelting and to prevent damage to machines from pieces of iron.

Rod Iron. Rod Iron (Daarlig Jern.). Teknisk Ukeblad, vol. 66, no. 51, Dec. 12, 1919, pp. 669-674, 4 figs. Report of Kristiania Testing Station for Material. Photomicrographs are presented.

Rolling. The Manufacture of Iron by the Use of Rolls, W. S. Standiford. Can. Machy., vol. 24, no. 3, July 15, 1920, pp. 67-71, 6 figs. Methods of grading, piling, refining and other processes to completion.

Silicon, Magnetic Properties of. On the Magnetic Properties of Silicon Iron (Stalloy) in Alter-

nating Magnetic Fields of Low Value, Albert Campbell. Physical Soc. of London, Proc., vol. 32, no. 4, June 15, 1920, pp. 232-243, 5 figs. Measurements are described of the hysteresis-losses in silicon iron sheet and wires in very low alternating magnetic fields at low and telephonic frequencies, using an alternating-current method. Comparisons are made between sheet material and wires of different diameters, and curves are given showing improvement in permeability of wires when they are annealed.

Wrought, Corrosion of. Influence of Enclosed Slag on the Corrosion of Wrought Iron, L. T. Richardson. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 9, pp. 99-104, 3 figs. Microscopic examinations said to have failed to furnish any visible evidence that slag inclusions hinder progress of corrosion. Because corrosion of transverse and longitudinal sections is the same as regards loss in weight and depth of pits, conclusion is reached that any superior resistance wrought iron may have is not due to slag inclusions but to purity of iron.

[See also STEEL, Properties Below Critical Range.]

IRON ALLOYS

Iron-Carbon. On Graphitization of Iron-Carbon Alloys. Kōtarō Honda and Takejirō Murakami. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 7, 8 pp. Results of experiments established that in pure iron-carbon alloys, graphitization is caused by decomposition of cementite solidified during cooling from melt. It is held that graphitization is not direct decomposition of cementite at high temperature but is caused by catalytic action of carbon monoxide or dioxide.

On the Graphitization in Iron-Carbon Alloys, Kuniichi Tawara and Genschichi Asahara. Jl. College of Eng., Tokyo Imperial University, vol. 9, no. 6, Nov. 25, 1918, pp. 197-237, 38 figs. partly on 12 supp. plates. Various alloys with carbon content ranging from 2 to 4 per cent were cast under different conditions. Factors, such as casting temperature, temperature of mold, time and mode of cooling, were found to do nothing more than define solidifying velocity of molten metal and cooling velocity of it after solidification. It is concluded that under the same conditions the higher the temperature of a molten is, the more graphitization occurs. Graphite was produced at temperatures of 1100 deg. cent. and 1000 deg. cent., the former being the more favorable, while it was not at temperature of 900 deg. cent.

Iron-Nickel. Forgeability of Iron-Nickel Alloys, T. D. Yensen. Min. & Metallurgy, no. 157, section 9, Jan. 1920, 12 pp., 13 figs. Experimental. Pure iron-nickel alloys did not forge readily at ordinary forging temperatures; aluminum, carbon, magnesium, or silicon had little or no effect upon forgeability; manganese or titanium in amounts of 2 per cent made alloys forgeable.

Magnetic and Electrical Properties of Iron-Nickel, T. D. Yensen. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 4, April 1920, pp. 396-405, 20 figs. Part I describes investigation undertaken to determine whether any iron-nickel alloys could be found having a higher saturation value than pure iron. Part II takes up magnetic and electrical properties of iron-nickel alloys, reversible and irreversible transformations.

See also NICKEL-IRON ALLOYS.

Properties of. Dependence of Magnetic Qualities, Specific Resistance and Density of Iron Alloys on Chemical Composition and Thermal Treatment (Ueber die Abhängigkeit der magnetischen Eigenschaften des spezifischen Widerstandes und der Dichte der Eisenlegierungen von der chemischen Zusammensetzung und der thermischen Behandlung), E. Gumlich and P. Goerens. Wissenschaftliche Abhandlungen der Physikalisch-Technischen Reichsanstalt, vol. 4, no. 3, 1918, pp. 273-420, 158 figs. partly on 9 supp. plates. Details of methods and apparatus used; description of tests and results. Carbon, silicon, aluminum and manganese alloys were tested. Tables showing magnetizing curves. Photomicrographs are presented.

The Electrical Properties of Iron Alloys, E. Gumlich. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 494-495. Report of committee appointed by Verband Deutscher Elektrotechniker to investigate magnetic properties of iron in so far as they depend on chemical constituents and thermal treatment. Translated from Electrotechnische Zeitschrift.

IRON AND STEEL

Production in U. S. Decreased Production of Iron and Steel. Iron Age, vol. 106, no. 15, Oct. 7, 1920, pp. 925 and 955. Statistics for 1919 compiled by Am. Iron & Steel Inst. Effect of steel strike and other unfavorable conditions is shown, but gains were made in output of number of products.

Production of Steel Ingots and Castings, Finished Forms of Rolled Iron and Steel, and Miscellaneous Iron and Steel Products in the United States in 1919. Special Statistical Bul. no. 4, 1920, of Am. Iron & Steel Inst., Sept. 25, 1920, 4 pp.

IRON CASTINGS

Acid-Resisting. Castings for the Chemical Industry (Guss fur die chemische Industrie), H. Geissel. Giesserei-Zeitung, vol. 16, nos. 17 and 19, Sept. 1 and Oct. 1, 1919, pp. 257-260 and 292-297, 9 figs. Various acid-resisting cast-iron products of the Krupp, Esslingen and Golzen-Grimma works are described and illustrated.

Centrifugal Process. British Adopt Centrifugal Casting, Gwilym Williams. Foundry, vol. 48, no. 6, Mar. 15, 1920, pp. 213-218, 15 figs. Primary conceptions of casting in rotating molds, evolution and final application of process to manufacture of piston rings are discussed. Paper read before Coventry branch Inst. British Foundrymen.

Diesel-Engine. Diesel Engine Castings, F. J. Cook. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 4, Feb. 1920, pp. 166-182, 9 figs. and (discussion), vol. 36, parts 5 and 6, Mar. and May, pp. 183-215 and 425-434, 7 figs. Proportions of the various chemical elements which author has found to give good results for Diesel engine cylinder liners and pistons are: total carbon, 3 to 3.2 per cent; silicon, 1 to 1.2 per cent; phosphorus, not over 1 per cent; sulphur, 0.12 per cent; manganese, not over 0.5 per cent; and that most advantageous amount of steel to be added to mixture is 15 per cent. Describes two useful workshop tests.

Large. An Interesting Casting, Made in a Loam Mould, F. H. Bell. Can. Foundryman, vol. 10, no. 12, Dec. 1919, pp. 339-341, 7 figs. Casting is 2¼ in. thick, 9 ft. in diameter, and weighs approximately 13,000 lb.

Light, Stresses and Strains in. Stresses and Strains on Light Castings, A. Fraser. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 218, Feb. 1920, pp. 126-130, 18 figs. Results of experiments made by writer with idea of studying seeming vagaries of bent, broken and twisted light castings in grey iron. Paper read before Coventry Branch, Institution of British Foundrymen.

Reversed Chilled. "Reversed Chilled Castings"

(''Umgekehrter Hartguss''), Käthe Hartnecker. Stahl u. Eisen, vol. 39, no. 44, Oct. 30, 1919, pp. 1307-1308, 13 figs., partly on one supp. plate. Increased amounts of sulphur and phosphorus were found to be present in white part of ''reversed chilled castings''; possibility of insufficient cooling through changed conditions of crystallization is referred to. Photomicrographs are presented.

Rubber Molds. Making Rubber Mold Castings, Pat Dwyer. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp. 43-48, 7 figs. Special devices used for rubber mold castings.

[See also DIESEL ENGINES, Castings for.]

IRON DEPOSITS

Alberta. The Iron Ore Occurrences in Alberta, John A. Allan. Iron and Steel of Canada, vol. 3, no. 6, July 1920, pp. 185-190. Occurrences of iron ore in Alberta which can be mined economically and manufactured within province where there is ample supply of coal and natural gas for fuel.

Gunflint District, Minnesota. Economic Geology and Stratigraphy of the Gunflint Iron District, Minnesota, T. M. Broderick. Economic Geology, vol. 15, no. 5, July-Aug. 1920, pp. 422-452, 2 figs. Deposits are low-grade magnetite bearing rock. Their availability for magnetic concentration is discussed.

IRON FOUNDING

Chaplets. Disadvantages and Limitation of the Use of Chaplets (Nachteile bei der Verwendung von Kernstützen und deren Einschränkung). Zeitschrift für die gesamte Giessereipraxis, vol. 40. Some examples are given where the use of chaplets was successfully eliminated.

Filling Shrink Holes. The Welder in the Iron Foundry, David Baxter. Acetylene Jl., vol. 21, no. 10, Apr. 1920, pp. 667-673, 4 figs. Directions for filling shrink holes.

Heavy Work, Rigging for. Rigging Heavy Repetition Work, Pat Dwyer. Foundry, vol. 48, no. 12, June 15, 1920, pp. 469-472, 5 figs. Practice of Ohio foundry which during war established record of producing one complete set of castings for 2800-horsepower marine engine every day continuously for several months.

Ingot Mold Casting. Large Ingot Mold Casting. Iron Age, vol. 105, no. 20, May 13, 1920, pp. 1365-1366, 3 figs. Molding and pouring problems in making 114-ton iron mold.

Modern Practice. How Machine Castings Are Made. Foundry, vol. 48, no. 10, May 15, 1920, pp. 379-383, 8 figs. Practice of modern foundry company. Mechanical equipment makes it possible, it is said, to produce castings conforming to severe specifications with unskilled labor.

The Production of Good Iron Castings, Richard Moldenke. Iron Age, vol. 106, no. 4, July 22, 1920, pp. 191-193. Discusses sulphur problem, use of sea coal and selection of pig iron and scrap. Address delivered at convention of Southern Metal Trades Assn.

Pouring Direct from Blast Furnace. Making Ore Pile Part of Automotive Plant, F. L. Prentiss. Iron Age, vol. 105, no. 19, May 6, 1920, pp. 1295-1302, 14 figs. partly on supp. plate. Plan of Henry Ford to pour castings direct from blast furnace.

Rotary Casting Machines. Rotary Casting Machines, G. Williams. Foundry Trades Jl. & Pattern Maker, vol. 22, no. 221, May 1920, pp. 345-351 and (discussion) pp. 351-352, 9 figs. Describes difficulties and limitations of rotary casting method, but points out that advantage of rotary casting over ordinary permanent-mold casting is that speed of production is greater, molds can be made comparatively simply, and there is no trouble with complicated gates and runners. Paper read before Instn. British Foundrymen.

[See also ELECTRIC FURNACES, Iron Foundry; IRON, PIG, Silicon Content; MOLDING METHODS; PATTERNS; SAND, MOLDING.]

IRON INDUSTRY

France. France's Iron and Steel Future, Francis Miltoun. Iron Trade Rev., vol. 67, no. 12, Sept. 16, 1920, pp. 780-786 and p. 792, 4 figs. Next to United States, France leads world in iron ore resources. Future developments of iron and steel industry in France are visualized.

Germany. The German Iron and Steel Trade. Eng. Production, vol. 1, no. 8, Aug. 1920, pp. 297-298. View is expressed that ''as Germany cannot buy, so also she cannot produce'' and is therefore just at present ''not a serious rival''; but it is observed that ''Germany is still a perfect industrial machine, running at low speed,—but undamaged as yet in its vital parts and would respond rapidly to any stimulus.''

IRON METALLURGY

Alpha and Beta Crystals. Crystallography of Alpha and Beta Iron, Federico Giolitti. Chem. & Met. Eng., vol. 22, no. 13, March 31, 1920, pp. 585-589, 17 figs. Classification of various microscopic appearances of hypo-eutectoid steels based upon hypothesis that alpha iron has plate-like habit, while beta iron has granular habit.

Electric Smelting. Electric Smelting of Iron Ore with Coke, George Stig. Chem. & Met. Eng., vol. 23, no. 1, July 7, 1920, pp. 29-31. Gives data on run with coke which, it is said, demonstrated that electrometal furnace is suitable for operation with coke, and writer is of opinion that a correctly designed furnace of described type at present should give best results economically, and also that in order to obtain good results economically large furnaces should be employed. Translated from Teknisk Ukeblad.

IRON MINES

Accounting. Iron Mine Accounting, Charles F. Bomer. Jl. of Accountancy, vol. 30, no. 3, Sept. 1920, pp. 180-185. Items to be considered.

Shaft Sinking. Sinking a Shaft by the Francois Cementation Process at the Brymbo Steel Company's Hilditch Ironstone-Mine, Chesterton, Staffordshire, A. Hassam and T. T. Mawson. Trans. Instn. Min. Engrs., vol. 58, no. 1, Nov. and Dec. 1919, pp. 16-26 and (discussion) pp. 26-28, 12 figs., on three supp. plates. Including itemized accounts of cost of sinking by cementation.

IRON MINING

Birmingham, Ala. Iron Mining in the Birmingham District, George J. Young. Eng. & Min. Jl., vol. 110, no. 6, Aug. 7, 1920, pp. 249-255, 12 figs. Region is raw-mineral producing and manufacturing center. Products are of varied nature and include pit iron, coke, coal and dolomite. Mining methods undergoing changes.

Electrically Operated Mine. Iron Mines at Port Henry, N. Y., Charles A. Blatchly. Eng. & Min. Jl., vol. 109, no. 12, Mar. 20, 1920, pp. 702-704, 4 figs. Magnetic iron ores are mined by underground methods, using power shovels to load ore into cars. Electric power is used in operation of mines, mills and blast furnace.

Loading Machines. See COAL MINING, Loading Machines.

Newfoundland. The Sinking of Wabana No. 3

Slopes, Newfoundland, R. E. Chambers. Iron & Steel of Canada, vol. 3, no. 2, March 1920, pp. 52-61, 9 figs. Work consisted in driving two parallel slopes, each two miles long, and each with cross-section of 10 ft. x 17 ft. at average grade of about 13 per cent from main level of Scotia submarine mine to surface near outcrop of lower bed of ore.

Production in U. S. in 1919. Iron Mining in the United States. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 240-241. Production throughout various mining districts is said to have been lower than that of 1918, particularly so in Lake Superior districts, where, it is quoted, shipments amounted to only about 80 per cent of that obtaining in either of two years previous.

IRON ORE

Analysis. A Rapid Accurate Method for the Analysis of an Iron Ore, Ernest Little and Willard L. Hult. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 269-273. Modifications are suggested in dichromate method.

Lake Superior District. The Future of the Lake Superior District as an Iron-Ore Producer, Edward W. Davis. Bul. of University of Minnesota, vol. 23, no. 18, May 22, 1920, 18 pp. Opinion is expressed that district can continue to produce immense tonnages of iron ore for many centuries by utilizing its low-grade ore material.

Lorraine Deposits. The Lorraine Iron Field and the War, Alfred H. Brooks. Eng. & Min. Jl., vol. 109, no. 19, May 8, 1920, pp. 1065-1069, 6 figs. Annual production in 1913 was 50,000,000 tons, and 34 per cent of metallic iron used in Europe came from Lorraine ores.

Mesabi Range. Estimates of Mesabi Range Orebodies. Eng. and Min. Jl., vol. 110, no. 8, Aug. 21, 1920, pp. 350-354, 2 figs. Cross-section method of estimation is said to permit accurate interpretation of available data of iron orebodies.

New Zealand. The Utilization of Titaniferous Iron Ore in New Zealand, J. A. Heskett. Iron & Steel Inst., Paper 4, Annual Meeting, May 6 and 7, 1920, 14 pp., 4 figs.; also Min. & Metallurgy, no. 162, June 1920, pp. 29-30, 2 figs.; and Eng., vol. 109, no. 2843, June 25, 1920, pp. 875-877, 4 figs. Deposits are limonite, also found as lower hydrated oxides, and combined magnetite and ilmenite. It is said that by mixing coking coal with fine iron sand found in Taranaki, New Zealand, in proportion of 1 to 1, coke or ferrocoke containing 36 per cent metallic iron and 40 per cent carbon was obtained. Author is convinced that TiO_2 will form up to 20 per cent of a slag, which is as fusible as any blast-furnace slag.

Nickel-Bearing. Nickel-Bearing Iron Ore in Celebes (Nikkelhoudende laterietische ijzerertsen op Celebes), W. Dieckmann. Ingenieur, vol. 34, no. 43, Oct. 25, 1919, pp. 782-787, 2 figs. Analysis of ore found. Discussion of possibility of establishing iron industry in Dutch Indies. Paper read before Kon. Instituut van Ingenieurs.

Ontario, Utilization of. See FURNACES, Metallizing.

Production, Lake Superior District. 1919 Ore Shipments Analyzed, A. J. Hain. Iron Trade Rev., vol. 66, no. 7, Feb. 12, 1920, pp. 497-500, 1 fig. Table is presented of official record of shipments from Lake Superior district in 1919 and 1918, and graphic record of shipments by ranges for past 30 years. Reports are said to show Lake Superior movement totaled 48,812,522 tons in 1919, a decrease of 14,023,650 from 1918.

South Africa. Hematite Iron Ore in the Rustenburg District, A. L. Hall and C. J. N. Jourdan. South African Jl. Industries, vol. 2, no. 12, Dec. 1919, pp. 1118-1126, 3 figs. Description of hematite deposit on farm Buffelshock No. 151, which is said to be a bedded sedimentary iron ore, and to represent exceptionally rich portions of banded ironstone.

Titaniferous. See New Zealand.

Titanium in. See TITANIUM, Estimation in Iron Ore.

Valuation. The Valuation of Ores and Iron Making Material, C. H. Ridsdale. Iron & Steel Inst., Paper 8, Annual Meeting, May 6 and 7, 1920, 30 pp. Arrangement introduced by writer for valuing iron-making material, giving at a glance approximately pig, gas, slag formers (acid and basic), respectively, grouped together. See also Colliery Guardian, vol. 119, no. 3098, May 14, 1920, pp. 1357-1358.

World Deposits. Political and Commercial Geology Series. The Iron Ores of the World, E. C. Harder and F. T. Eddingfield. Eng. & Min. Jl., vol. 109, no. 23, June 5, 1920, pp. 1060-1064. Occurrence, geographical distribution, and importance of respective types. Economic position and production of various countries, influential factors which will govern future developments in iron and steel industry.

IRON, PIG

Silicon Content. Importance of Silicon Content of Pig Iron in Iron and Steel Foundries (Die Bedeutung des Siliziumgehaltes des Roheisens in der Eisen- und Stahlgiesserei), Johannes Habscheidt. Giesserei-Zeitung, vol. 16, no. 16, Aug. 15, 1919, pp. 241-244. In view of the scarcity of hamartite (flourcerite), it is urged as an economic necessity that hamartite iron be apportioned according to its silicon content.

IRRIGATION

Argentina. Irrigation in Mendoza, Argentina, S. T. Henry. Eng. News-Rec., vol. 85, no. 8, Aug. 19, 1920, pp. 353-355, 6 figs. Project involving irrigation of 100,000 acres.

Canal Cleaning. Removal of Sand from Irrigation Canal by Sluicing. Eng. & Contracting, vol. 52, no. 20, Nov. 12, 1919, pp. 559-560, 1 fig. Sluiceways have been built at intervals of several miles and sand is removed by aid of water. From Sept. Reclamation Rec.

Removal of Vegetation from Twin Falls Irrigation Canals, R. M. Adams. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 319-321, 3 figs. Modified disk harrow found successful after eight years' trial of various methods and machines. Cost of operation is $24 per mile.

Concrete-Lined Canals. Concrete Lined Irrigation Canals. Concrete, vol. 16, no. 5, May 1920, pp. 244-246, 6 figs. Methods and costs on reclamation service work.

Method of Lining Irrigation Canal with Reinforced Concrete. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, p. 35, 1 fig. Concrete lining is 3 in. thick, of 1:2:4 mix, and is reinforced with No. 11 electric welded 12 in. by 12 in. mesh wire.

Current Motors. An Automatic Current Motor. Engr., vol. 130, no. 3378, Sept. 24, 1920, p. 308, 2 figs. Device for utilizing force of stream for lifting water from it primarily for irrigation purposes, patented by F. L. Gilman, of Los Angeles, Cal.

See also WATER WHEELS, Current Wheel.

Ditch Calculations. Determination of Lateral Capacities to Supply Irrigation Requirements, J. L. Franzen. Contract Rec., vol. 34, no. 11, Mar. 17, 1920, pp. 244-249, 4 figs. Procedure used in calculating size and profile of ditches,

taking seepage loss into consideration. How crop requirements govern applications of water and period of irrigation.

Flumes. Types of Flume in Yakima Valley Irrigation Districts, W. A. Scott. Eng. World, vol. 17, no. 3, Sept. 1920, pp. 154-156, 10 figs. Concrete, wood-stave and metal flumes.

Gunnison Tunnel. Operation and Maintenance of the Gunnison Irrigation Tunnel. Eng. and Contracting, vol. 54, no. 10, Sept. 8, 1920, pp. 231-232, 7 figs. Tunnel is 30,582 ft. long. Floor was lined throughout, and side walls and arch only where material was soft. Results of investigations made to determine value of coefficient n in Kutter's formula are included.

Pacific Northwest. The Duty of Water in the Pacific Northwest, J. C. Stevens. Proc. Am. Soc. Civil Engrs., vol. 46, no. 3, Mar. 1920, pp. 461-480, 1 fig. By duty of water is meant average percentage of soil mixture that should be maintained for particular soil and crops. Quantity of irrigation water that, with precipitation and unavoidable losses, will maintain required amount of soil moisture in Pacific Northwest region of United States, is investigated.

Pumps. An Explosion Pump in Irrigation Service. Power House, vol. 13, no. 4, Feb. 20, 1920, pp. 73-75, 4 figs. It is stated that direct-acting explosion pump contains no pistons or other reciprocating mechanism beyond an oscillating column of water upon which gaseous products of combustion act.

Soils, Permeability of. Concerning Irrigation Problems (Un des aspects du problème de l'Irrigation), J. Lemarchands. Houille Blanche, vol. 18, nos. 31 and 32, July and Aug. 1919, pp. 158-163, 2 figs. Experimental researches of permeability of various soils.

[See also TUNNELS, Driving, Cost of.]

ISOTOPES

Spectra. See SPECTRA, Isotopes.

J

JACOBIANS

Critical, Calculation of. Approximate Calculation of Elements of Critical Jacobians of High Order (Sur le calcul approché des éléments des Jacobiens critiques d'ordre élevé), Pierre Humbert. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 20, Nov. 17, 1919, pp. 902-903. Applications of Liapounivʼs method.

JAPANNING

Electric. Electric Japanning Gives Extreme Satisfaction. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1 and 8, 1919, pp. 876-879, 5 figs. Method of operating and comparison with gas kiln for baking japan.

Methods. A Study of the Methods and Operations of Japanning Practice, W. A. Darrah. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 712-715, 7 figs. Equipment necessary for storage, handling, conveying, cleaning and baking departments.

JIGS

Drilling. See DRILLING MACHINES, Jigs for.

Examples of. Nine Examples of Jig and Fixture Practice, J. H. Moore. Can. Machy., vol. 24, no. 15, Oct. 7, 1920, pp. 326-327, 5 figs. Various principles are discussed such as snap-per, universal chuck, turnover and slide stop motion.

Indexing. A Progressive Indexing Jig. Am. Mach., vol. 52, no. 1, Jan. 1, 1920, pp. 7-9, 4 figs. Tools used in making roller cage for roller bearing of rolling mill.

Milling-Machine Construction. Examples of Jig and Fixture Work, J. H. Moore. Can. Machy., vol. 22, no. 26, Dec. 25, 1919, pp. 613-615, 5 figs. Types used in milling machine construction.

Production. Successful Systems Applied to Jig and Tool Production, S. E. Crooke. Machy. (Lond.), vol. 15, no. 390, March 18, 1920, pp. 786-788, 5 figs. System is suggested for controlling amount of work flowing into tool room.

JOINTS

Shrunk-Link. See SHRINK RINGS, Use.

Universal. See UNIVERSAL JOINTS.

JUTE

Dyeing. The Preparation and Dyeing of Jute. Textile World Jl., vol. 56, no. 18, Dec. 6, 1919, pp. 70, 75 and 107. Treatment of material. Classes of colors employed.

[See also ROPE DRIVE.]

K

KALLIRONTRON

See VACUUM TUBES, Three-Electrode.

KAOLIN

See CLAYS, Kaolin.

KENOTRONS

See RECTIFIERS, Kenotron.

KEROSENE

See AUTOMOBILE FUELS, Kerosene.

KEROSENE ENGINES

Caffort. New French Kerosene Engine Has Single Sleeve Valves, W. F. Bradley. Automotive Industries, vol. 42, no. 18, April 29, 1920, p. 1009, 2 figs. Engines which secured prize given by Automobile Club of France are now being built by Caffort Company of Paris. Kerosene is used according to Bellem and Bregeras system. Engines are built with one, two or four cylinders, and have bore and stroke of 4.3 x 6.2 in. They have single sleeve driven by eccentric off a half-time shaft in base chamber. Horsepower obtained from 4-cylinder engine is 23 at 600, 25 at 700 and 30 at 800 r.p.m.

Heavy-Duty Type. Kerosene as a Fuel in High-Speed Engines, Lawrence F. Seaton. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 881-882, 3 figs. Tests on high-speed heavy duty type of engine using kerosene as fuel showed that thermal efficiency of engine was practically constant throughout all heat changes, but motor became more flexible especially when temperature of ingoing air was raised. It was also found that at low heats motor would not idle down below 800 or 900 r.p.m.

Marine. Six-Cylinder 90-B.H.P. Paraffin Marine

Motor. Eng., vol. 109, no. 2842, June 18, 1920, pp. 820-821, 9 figs. Crankshaft bearings are held in lower half of crankcase, caps being on top of shaft instead of beneath as is usual in motor-car practice.

[See also GASOLINE ENGINES, British Marine.]

KEYS

Flat, Design of. Flat Keys (Die Flachkeile), P. Stephan. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 15 and 17, Apr. 15 and 29, 1920, pp. 113-119 and 135-137, 5 figs. It is shown that the stress carried by flat keys is generally estimated at too low a value, and tables are given based on formulæ derived, that are said to offer safe and suitable values for use in design.

Length of. A Chart for Lengths of Keys, John S. Watts. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 560-561, 2 figs. Standard width and thickness of key is assumed for each diameter of shaft. Chart gives length of standard size key that will transmit required torque at each diameter of shaft.

Standardization of. Measurement of the Thickness of Keys (Keilhöhenmessung), Kurt Hentschel. Betrieb, vol. 2, no. 13, July 1920, pp. 358-359, 11 figs. By comparison of advantages and disadvantages of measurements at thick end, thin end and in the middle, it is shown that measurement at thin end is the only feasible one for standardization.

KEYSEATING MACHINES

See MACHINE TOOLS, Special; MORTISING MACHINES.

KILN DRYING

See AIRCRAFT CONSTRUCTION MATERIALS; DRY KILNS; WOOD, Kiln Drying.

KILNS

Producer-Gas-Fired. Producer Gas Solves Fuel Problem. Rock Products, vol. 23, no. 1, Jan. 3, 1920, pp. 60-62, 11 figs. Kiln designed for either wood or gas burning without change, or also combination of these two fuels.

Rotary. The Loss of Heat in Rotary Kilns through Conduction and Radiation of Heat (Der Wärmeverlust des Ringofens durch Wärmeleitung und -strahlung), R. Clauss. Ziegelwelt, vol. 51, no. 8, Feb. 21, 1920, pp. 87-88. It is shown that this loss is considerable and that it is wasteful to make use of kilns for short periods. The simplest method of utilizing conduction and radiation losses is said to be the installation of drying plants above and at the side of the kiln.

Tunnel. The Continuous Tunnel Kiln, Carl B. Harrop. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 697-700. Advantages of car tunnel type of continuous kiln.

The Dressler Tunnel Kiln for Firing Sanitary Ware, George Brain. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 706-711, 1 fig. Continuously operated kiln of muffle type, approximately 250 feet long, capable of holding 44 trucks, each measuring 5 ft. 8 in. long and 3 ft. 6 in. wide.

The Tunnel Kiln Applied to Ceramics, Samuel Trood. Jl. Am. Ceramic Soc., vol. 3, no. 9, Sept. 1920, pp. 701-705. Comparison of periodical beehive kiln with continuous car tunnel type.

KITE BALLOONS

Telephones. See TELEPHONY, Kite Balloons.

[See also METEOROLOGY, Kite Balloon.]

KRYPTON

Spectra. See SPECTRA, Krypton and Neon; Krypton and Xenon.

L

LABOR

American, Mobility of. Mobility of Labor in American Industry, Paul F. Brissenden and Emil Frankel. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 36-56, 2 figs. Notes on definition and measurement of labor mobility; scope and limitations of the basic data; seasonal influences on labor mobility, and length of service as a factor; effect of employment policy on labor stability, etc. Summary review of bulletin to be published by Bur. of Labor Statistics.

Bibliography. Publications Relating to Labor. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 284-303. List of official and unofficial periodicals published in U. S., Australia, Canada, France, Germany, Great Britain, India, Italy, New Zealand, Roumania and Switzerland.

Contracts. Essentials of a Labor Contract, Edwin Gruhl. Elec. Ry. Jl., vol. 55, no. 2, Jan. 10, 1920, pp. 96-101. Writer first outlines principles underlying proper relation of employer and employee and then sets forth and discusses section by section suggested labor contract.

Eight-Hour Laws. Comparison of Foreign Eight-Hour Laws, Leifur Magnusson. Monthly Labor Rev., vol. 10, no. 3, March 1920, pp. 184-198. Comparison is made of provisions of various 8-hour laws and international 8-hour convention adopted at International Labor Conference in Washington, Oct. 29-Nov. 29, 1919. International convention is found more definite and comprehensive than legislation provisions so far adopted by various countries.

Employer's Duty. The Employer's Duty in Dealing with Labor, Harry Tipper. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 832-833. Writer points out futility of general settlements of labor difficulties. He observes that employees and employers of individual factories must work, one with the other, to obviate broken contracts and excessive demands from labor and to assure justice from organization head.

Franco-Italian Treaty. The New Franco-Italian Labor Treaty. U. S. Dept. of Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 47-53. Treaty provides that workers of either country, when employed in the other, shall be on same footing as nationals with respect to labor conditions and shall enjoy the same benefits with reference to relief and social insurance.

Great Britain. The Course of Labor and the Workers' Tendency in Great Britain, Clarence H. Northcott. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 970-973. Attitude of labor in regard to increased production. It is said that in spite of placards and notices emphasizing the necessity for increased production in country, "labor is little interested" and "they do not see either the use or necessity of continued toil."

What the British Worker is Thinking, Clarence H. Northcott. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 96-99. It is said that British worker "wants a richer and a fuller life, with a higher status and a more adequate

recognition of himself as a human being,'' and it is pointed out that employers who do not recognize this ''may expect industrial unrest, endless friction, diminished output and considerable trouble.''

Hours of Work. Hours of Work and Accident Rate. Eng. and Indus. Management, vol. 4, no. 11, Sept. 9, 1920, pp. 334-336. Conclusions reached by Public Health Service in America as to output and incidence of accidents under different schedules of hours, together with some related factors. Objective tests of working capacity among factory employees working under normal conditions were studied in two plants, one engaged in manufacture of munitions, the other in production of motor cars.

Methods of Reducing Hours of Work in Great Britain. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 251-254. Three ways are explained, (1) one-break day system; (2) two day-shift system; (3) five-day week system.

Recent Application of the 8-Hour Day and the 44-Hour Week. Monthly Labor Review, vol. 9, no. 5, Nov. 1919, pp. 194-199. Statistical figures give number of establishments reported as adopting 8-hour day in 1915, 1916, 1917, 1918 and first 6 months of 1919.

The Hours of Work Problem in Five Major Industries. Natl. Industrial Conference Board, no. 27, March 1920, 91 pp., 2 figs. Summary of investigations thus far made by Nat. Industrial Conference Board of effects of changes in weekly hours of work on output and health of workers.

Why It Paid Us to Adopt the Five-Day Week, Richard A. Feiss. Factory, vol. 25, no. 4, Aug. 15, 1920, pp. 523-526, 2 figs. Example of manufacturer is given who, it is said, during period of abnormal conditions, turned to plan of paying bonuses in time instead of money. It is stated that increased production resulted in 14 per cent less time.

See also Eight-Hour Laws; WAGES, Woodworking Industry.

International Conference. The International Labor Conference, V. B. Turner. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 1-26. Account of work done by first world labor conference which was in session in Washington from Oct. 22 to Nov. 29, 1919, and was called in accordance with provisions of labor convention in Peace Treaty.

Minimum Wage, California. Effect of Minimum Wage Orders in California. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 261-263. It is said that no establishment was forced out of existence by order and that number of employees was not decreased but increased 10 per cent. Minimum wage is considered in consequence as real remedial measure.

Mining Industry. See INDUSTRIAL RELATIONS, Mining Industry.

Periodicals Relating to. Publications Relating to Labor. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 284-303. List of official and unofficial periodicals published in U. S., Australia, Canada, France, Germany, Great Britain, India, Italy, New Zealand, Roumania and Switzerland.

Responsibilities of. Labor and Its Responsibilities, Charles Piez. Coal Age, vol. 16, no. 22, Dec. 11 and 18, 1919, pp. 882-884. Address delivered before Am. Min. Congress.

Shortage in Construction Industry. Immigration and the Construction Industry. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 642-643. Labor shortage not yet relieved by growing number of immigrants who are mostly women and children. Prohibition said to be no deterrent.

Unemployment. See UNEMPLOYMENT.

Unrest. See INDUSTRIAL RELATIONS, Unrest.

U. S. Department of. Keeping the Peace with Labor, Mark Huntington Wiseman. Indus. Management, vol. 59, no. 3, March 1920, pp. 177-183, 1 fig. Survey of work done by U. S. Department of Labor. Department was created by Act of Congress in March 1913

Wages. See WAGES.

Washington Trades-Union Conference. Labor: Its Grievances, Protests and Demands. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 33-41. Declarations adopted at conference of national and international trades-unions and executives of four railroad brotherhoods held at Washington, D. C., Dec. 13, 1919.

Workmen's Compensation. See WORKMEN'S COMPENSATION.

[See also INDUSTRIAL RELATIONS; TRADE UNIONS.]

LABOR TURNOVER

Causes. The New Employee as a Vital Factor in Labor Turnover, Norman G. Shidle. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1216-1218, 5 figs. It is claimed that greater part of labor turnover occurs among employees who have been in service less than two months, which condition necessitates that particular attention be given to methods of securing employment.

Cost of. Finding Out What Turnover Costs, J. R. Sedgwick. Factory, vol. 25, no. 4, Aug. 15, 1920, pp. 530-532, 4 figs. Method is suggested for determining exact figures on cost of labor turnover.

Mathematical Analysis. Labor Turnover, Carl G. Barth. Bul. Taylor Soc., vol. 5, no. 2, Apr. 1920, pp. 52-58, 4 figs. It is mathematically studied whether average working force for period considered, as ascertained from number of workers on total payroll, should be made denominator of labor-turnover fraction, or whether working force so to be used should include only average number of workers actually in attendance during that period. Conclusion reached is in favor of total separations as against replacements only, regardless of whether total force is increasing or decreasing.

Measurement. The Mathematics of Labor Turnover, Carl G. Barth. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 315-318, 4 figs. It is concluded from mathematical analysis that labor turnover should be measured by dividing average total payroll into factor of total separations of workers from a force.

Recording. Keeping Track of Labor Turnover. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 978-979, 4 figs. Forms used by a large manufacturer to record employment and loss of labor.

Reducing. Definite Analysis Methods Help Solve Labor Difficulties, Norman G. Shidle. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1166-1168, 2 figs. Efforts of Goodyear Tire & Rubber Co. to reduce its labor turnover and to obtain contented and satisfactory workmen.

Remedies for. Labour Turnover in Industrial Plants and What Steps Can Be Taken to Minimize It, A. W. McDonald. Monthly Bul. Can. Inst. Min. and Metallurgy, no. 101, Sept. 1920, pp. 705-709. Most important and effective method is believed to be establishment of properly administered employment department.

LABORATORIES

Aerodynamic, Italy. Aerodynamic Laboratory of the Royal Polytechnic Institute of Turin, Italy

(Il laboratorio di aerodinamica del R. Politecnico di Torino), Cesare Chiodi. Associazione Nazionale degli Ingegneri Italiani, vol. 1, nos. 4, 5 and 6, Feb. 10, 20 and 29, 1920, pp. 21-25, 29-31 and 35-36, 12 figs. Description of machinery and equipment.

Aeronautic. Aeronautical Studies at the Eiffel Aerodynamic Laboratory from 1915 to 1918 (Etudes sur l'aéronautique faites au laboratoire aérodynamique Eiffel de 1915 à 1918). Génie Civil, vol. 76, no. 14, April 3, 1920, pp. 325-329, 8 figs. Equipment is described, notably wind tunnel, and summary is given of principal results obtained. From book by G. Eiffel, published by Chiron, Paris.

Carburetion Research. The Design of a Laboratory for Carburetion Investigation. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 906-911, 8 figs. Description of the dynamometer laboratory at plant of the Stewart-Warner Speedometer Corporation, one of chief uses of which is development of fittings of the Stewart heavy-fuel system to engines and automotive apparatus; but it is claimed, besides this, an unusual amount of research in carburetion has been carried out.

Ecole Supérieure d'Electricité. Annual Report on the Central Laboratory and the Ecole Supérieure d'Electricité (Rapport annuel sur le laboratoire central et l'Ecole Superiéure d'Electricité), P. Janet. Bulletin de la Société Française des Electriciens, vol. 10, no. 88, April 1920, pp. 130-145. Researches on electricity during 1919.

Engineering Works. A Marine-Engineering Works Laboratory. Engineering, vol. 198, no. 2806, Oct. 10, 1919, pp. 467-468 and 482, 3 figs. Equipment contains 50-ton Buckton testing machine of screw type driven by separate electric motor, Sand's rotating apparatus for electrolytic analysis, electric drying oven, Boverton Redwood viscosimeter, gray oil flash-point apparatus, Humfrey carbon combustion furnace and Richmond muffled furnace.

Forest Products. The Relation of the Work of the Forest Products Laboratory to Engineering, George M. Hunt. Jl. Western Soc. Engrs., vol. 25, no. 9, May 5, 1920, pp. 312-326 and (closure) pp. 325-329, 7 figs. Description and illustrations of the Forest Products Laboratory and account of information which can be obtained by the railroad engineer and wood preserver, the chemical engineer, structural engineer and architect, and the aircraft or automotive engineer.

Industrial. A Novel Laboratory for Industrial Research. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 496-498, 3 figs. Description of research laboratory organized to study and develop new and economical problems relating to chemical and metallurgical processes and equipment, with enumeration of some problems which are being studied.

Experimental and Research Laboratory of the Hall-Scott Motor Car Company, Richard Vosbrink. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 370-372. Equipment for testing automobile engines.

Laboratory at the Holt Manufacturing Company. Metal Trades, vol. 11, no. 8, Aug. 1920, pp. 342-343. Equipment and organization of metallurgical laboratory where materials purchased are analyzed and tested.

Mechanical Engineering, Univ. of Ill. The New Mechanical Engineering Laboratory, College of Engineering, University of Illinois, Charles Russ Richards. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 110-113 and 144, 7 figs. Description of laboratory and equipment.

National Physical, England. The National Physical Laboratory. Eng., vol. 110, no. 2845, July 9, 1920, pp. 56-58, 2 figs. Methods of testing used in heat department.

New York Chemical Works. New Laboratory of the Newport Company, George E. Bird. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, p. 339, 2 figs. Plan of building laboratory and conveniences for research work.

Paper and Pulp. How to Equip and Operate an Experimental Laboratory—IV, Otto Kress, Sidney D. Wells and Vance P. Edwards. Paper, vol. 26, no. 16, June 23, 1920, pp. 23-25 and 32. Description of the Marx beater, wet machine and paper machine; and details of operation of these machines as accomplished by Government workers at the Forest Products Laboratory. Notes on testing bleach samples, making experimental bleach determinations and microscopic examinations of pulp and paper.

Photographic Research. A Photographic Research Laboratory, C. E. Kenneth Mees. Jl. Royal Soc. of Arts, vol. 68, no. 3539, Sept. 17, 1920, pp. 695-703 and (discussion) pp. 703-705, 4 figs. Survey of work done at research laboratory of Eastman Kodak Co.

Steel Works. See STEEL WORKS, Laboratory.

Testing. See SWITCHBOARDS, Testing-Laboratory.

Textile Research. Textile Research Laboratory, Herbert T. Wade. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 153-157, 8 figs. Miniature textile mill of Nat. Bur. of Standards.

LADDERS

Safety Code. The Requirements of the Industrial Code Relating to Ladders and Scaffolds, Peter C. Spence. Safety Eng., vol. 39, no. 5, May 1920, pp. 229-239. Records are included of results caused by falls from or due to ladders and scaffolds, through breaking, slipping, tilting, twisting, etc., in building industry for period of three years, together with classification of injuries in agreement with provision of Workmen's Compensation Law. From Proc. of Am. Soc. of Safety Engrs.

LADLE CRANES

See CRANES, Traveling.

LADLES

Hangers. See STEEL MANUFACTURE, Ladle Hangers.

Lifters for. Fractures in Ladle Lifters (Brüche an Giesspfännengehängen), A. Pomp. Stahl u. Eisen, vol. 40, no. 34, Aug. 26, 1920, pp. 1136-1138, 3 figs. Results of investigations show that fracture of a ladle lifter is due to changes in form of material at blue heat.

LAND SUBMERGENCE

See RAILWAY CONSTRUCTION, Land Submergence.

LATENT HEAT

Surface Energy and Molecular Volume. Latent Heat and Surface Energy, D. L. Hammick. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 32-46. On assumption that van der Waals' a varies with temperature, relation is derived between surface energy and molecular volume.

LATHE TOOLS

Cutting Power of. Cutting Power of Lathe Turning Tools, Geo. W. Burley. Jl. of Instn. Mech. Engrs., no. 10, Jan. 1920, pp. 755-822, 2 figs. It is concluded from experiments made in machine-tool laboratory of University of Sheffield that there is practically no cutting speed below which it is possible to obtain satisfactory surface on plain carbon steels by means of ordinary lathe finishing tools, whether these be made of plain carbon tool steel, ordinary non-vanadium high-speed steel, or superior vanadium high-speed steel; but there is maximum

limiting speed above which satisfactory finish cannot be obtained on account of tendency of tool to pluck at and tear surface, this tendency being related to phenomenon of building-up on cutting edge of tool.

LATHE WORK

Time Chart for. Time Chart for Lathe Turning. Machy. (Lond.), vol. 16, no. 399, May 20, 1920, p. 203. Describes and illustrates logarithmic chart from which, it is stated, any desired turning time can be determined for any known number of revolutions per min. and amount of feed within range of chart.

LATHES

All-Gear Selective Head Type. Dean, Smith & Grace 8½ Inch Centre Manufacturing Lathe. Machy. (Lond.), vol. 15, no. 384, Feb. 5, 1920, pp. 569-576, 12 figs. Lathe is of all-gear selective head type and is designed with rapid power traverse for saddle movement.

Automatic. Some Interesting Examples of Tool Layout, J. H. Moore. Can. Machy., vol. 24, no. 9, Aug. 26, 1920, pp. 195-197, 9 figs. Tool layouts of Potter and Johnston manufacturing automatic chucking and turning machines.

Brass-Working, Finishing Tools for. Tools for Fusible Plugs and Other Locomotive Parts, Frank A. Stanley. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 985-987, 8 figs. Tools for finishing in the brass-working lathe various sizes of fusible plugs and buttons and other brass parts, such as hose nozzles and cylinder drain cocks.

Camshaft, Gordon. The Gordon Camshaft Lathe, J. V. Hunter. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1085-1088, 7 figs. Lathe has been built for purpose of turning cam surfaces of camshafts used for operating valves in gasoline motors. Machine, it is explained, rough-turns cams from drop-forgings, work being performed previous to heat-treating.

Capstan. Capstan Lathe Practice. Machy. (Lond.), vol. 16, nos. 407-414 and 417, July 15, Sept. 2 and 23, 1920, pp. 445-449, 678-681 and 765-769, 47 figs. July 15: Examples of work finished in the hand screw machine, based on practice of Warner Swasey Co. Sept. 2: Tooling equipments used in machining castings and bar stock parts on hand screw machines. Sept. 23: Tooling equipments used in machining various parts on Warner & Swasey capstan lathes.

See also Turret.

Crankshaft. The Wickes Crankshaft Lathes, J. V. Hunter. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 57-58, 2 figs. Tools designed for high production of crankshafts.

Double-End Center-Drive. Greenlee Double-End Center-Drive Lathe, J. V. Hunter. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 815-817, 4 figs. Lathe developed by Greenlee Bros. Co., Rockford, Ill., for turning both ends of automobile axle at the same time, and now being applied to bar and shaft work requiring turning only on ends.

Drummond Toolroom. A New Tool Room Lathe. Automobile Engr., vol. 11, no. 141, Aug. 1920, pp. 323-327, 14 figs. Description of Drummond 7-in.-center machine.

Geared-Head. A 14-Inch Geared Head Lathe with Compact Motor Drive. Ry. Mech. Engr., vol. 94, no. 2, Feb. 1920, pp. 111-112, 3 figs. Lathe headstock is of selective type permitting operator to obtain any one of eight speeds without slowing down machine or removing cutting tool from work. It is stated that change from one speed to another cannot be detected on work even when such change is made while tool is taking a cut.

Gun-Boring. The Stamets Gun-Boring Lathe, E. L. Dunn. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1071-1073, 4 figs. Details and illustrations of gun-boring lathe designed by R. L. Hibbard and manufactured by William K. Stamets of Pittsburgh.

High-Speed. 18-In. High-Speed Sliding and Surfacing Lathe. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 513 and 516, 7 figs. Type constructed by Sir W. G. Armstrong, Whitworth and Co., Ltd., Manchester, and exhibited by them at Lyons Fair as maximum production machine.

Line-Bearing and Flange-Turning. Wickes Crankshaft Line-Bearing and Flange-Turning Lathe, J. V. Hunter. Am. Mach., vol. 53, no. 3, July 15, 1920, pp. 99-100, 4 figs. Line of lathes specially adapted to turning line bearings and flanges on automotive crankshafts.

Multi-Cut. Semi-Automatic Multi-Cut Lathe. Iron Age, vol. 104, no. 15, Sept. 25, 1919, pp. 866-867, 4 figs. Details and illustrations of latest product of R. K. LeBlond Machine Tool Co., Cincinnati, which is described as semi-automatic machine on which one or more facing and turning operations can be performed simultaneously, one operator running several machines.

Pit, Manufacture of. Large Work at the Poole Engineering and Machine Co.'s Shop, E. A. Suverkrop. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 143-145, 8 figs. Methods of manufacturing 22-ft. measuring machine and pit lathe of 100 ft. swing.

Railway-Shop. New Machine Tools for Locomotive and Railway Works. Ry. Gaz., vol. 32, no. 21, May 21, 1920, p. 772, 2 figs. Description and illustrations of a double-axle facing, drilling and centering lathe designed by Hulse & Co., Ltd., Salford, Manchester (England).

Relieving. The Relieving Lathe, Francis W. Shaw. Machy. (Lond.), vol. 15, no. 387, Feb. 26, 1920, pp. 673-684, 11 figs. Principles and operation of spiral relieving mechanism.

Relieving Attachment. Relieving Attachment for Lathes. Eng., vol. 109, no. 2828, Mar. 12, 1920, pp. 345-346 and 348, 12 figs. Attachment invented by E. M. Wildey, now being manufactured by Milton, Ltd., of London, for performing relieving work on ordinary screw-cutting lathe.

Screw-Cutting. Screws with an Increasing Lead. Machy. (Lond.), vol. 16, no. 398, May 13, 1920, pp. 173-174. Lathe for machining such screws.

Toolroom. See Drummond Toolroom.

Turret. A New Automatic Indexing Turret. Machy. (Lond.), vol. 16, no. 395, Apr. 22, 1920, p. 87, 2 figs. Square turret especially intended for use on center lathe.

Alfred Herbert No. 5 Automatic Turret Lathe. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 600-601, 1 fig. General-purpose automatic machines representative of English practice. Comparison with American automatic turret lathes.

Hexagon Turret Lathe. Eng., vol. 110, no. 2848, July 30, 1920, pp. 146-147, 4 figs. Machine designed specially for bar work. All movements are operated by power.

Libby Turret Lathe Practice. Machy. (N. Y.) vol. 26, no. 12, Aug. 1920, pp. 1132-1139, 23 figs. Tooling equipment employed by International Machine Tool Co., Indianapolis, Ind., in machining work on Libby turret lathe.

Millholland Geared-Head Turret Lathe, J. V. Hunter. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 485-486, 3 figs. Machine designed for intensive production. Only four geared spindle-speed changes are furnished.

Notes on Capstan and Turret Lathes, Joseph Horner. Mech. World, vol. 66, no. 1720, Dec.

19, 1919, pp. 290-291, and vol. 67, nos. 1723 and 1726, Jan. 9 and 30, 1920, pp. 18-19 and 66-67, 21 figs. Dec. 19: Details of back gears. Jan. 9: Types of heads with sliding gears in conjunction with friction-clutch changes and clutch changes alone. Jan. 30: Details of trip-and-stop arrangement.

The Vertical Turret Machine and Its Work, Fred R. Daniels. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 398-403, 15 figs. Uses of vertical boring and chucking machine on quantity production work, including description of equipment used on various machining operations.

Tooling Acme Turret Lathes. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 5-9, 12 figs. Tooling equipment for performing turret-lathe operations on friction pulleys, aluminum pistons, gear blanks and other machine parts.

Turret Lathe Design and Construction, Arthur F. Bennett. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 127-130, 4 figs. Important points involved in turret lathe design and some advantages and disadvantages of current practice.

Turret Lathe Practice, Erik Oberg. Machy. (Lond.), vol. 15, nos. 371, 373, 374, 383, 387, 391, 394 and 398, Nov. 6, 20, 27, 1919, Jan. 29, Feb. 26, Mar. 25, April 15 and May 13, 1920, pp. 174-180, 228-231, 261-269, 541-544, 686-693, 805-810, 29-35 and 157-163, 156 figs.; also Machy. (N. Y.), vol. 26, nos. 3, 4 and 6, Nov., Dec. 1919 and Feb. 1920, pp. 227-235, 344-351 and 514-520, 91 figs. Illustrating practice at English work shops. Tooling equipment for auto truck wheels. Tractor axle housings, wheel hubs and motor frames. Jan. 29: Fixture designed to hold cylinders of water-cooled aero-engine during boring and bossing of holes in head preparatory to receiving valve boxes which are welded into place. Feb. 26: Examples of practice based upon experience of Gisholt Machine Co. Mar. 25: Machine operations on "Le Rhone" rotary aero-engine crankcase. Apr. 15: Methods employed in machining large gas-engine pistons at works of Alfred Herbert, Ltd., England. May 13: Typical examples of work done on turret lathe, based upon practice of Warner & Swasey Co., U.S.A.

See also Capstan.

Wood, Automatic. Setting-Up and Operating the Automatic Lathe, W. H. Rohr. Wood-Worker, vol. 38, no. 9, Nov. 1919, pp. 28-29, 5 figs. Specially making, balancing and setting of knives, operations which are said to require considerable mechanical skill and good judgment.

LAUNCHING

Ships. See SHIPS, Launching.

LAVA

Artificial, Uses of. "Lava"—Not Valcanic but a Useful Material. Raw Material, vol. 2, no. 5, May 1920, pp. 204-206, 3 figs. It is stated that processes through which steatite is put before it becomes lava result in such extreme hardness that it cannot be cut except by diamond and it would take more than 2000 deg. of heat to make any impression on its resistance to high temperatures.

LEAD

Atomic Weight. The Atomic Weight of Lead from a Japanese Radio-Active Mineral, Theodore W. Richards and Jitsusaburo Sameshima. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 928-930. Experiments at laboratory of Harvard University. Average determined value of atomic weight of lead was, with ordinary lead, 207.184, and with Japanese lead, 207.13.

Electroplating of Steel. See ELECTROPLATING, Lead on Steel.

Intercrystalline Brittleness. Intercrystalline Brittleness of Lead, Henry S. Rawdon. Sci. Papers Bur. of Standards, no. 377, April 6, 1920, pp. 215-232, 11 figs.; also Min. & Metallurgy, no. 158, section 7, Feb. 1920, 16 pp., 11 figs. Type of deterioration of lead which renders metal weak, brittle and capable of being crumbled easily into grains is described. Deterioration occurs as result of corrosion during service; attack on metal is localized along crystal boundaries and brittleness produced is intercrystalline in its nature.

Production in 1919. Lead. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 118-119. Statistics of production for 1919.

Recovery from Lead Sulphate. The Problem of Reducing Lead Sulphate, F. N. Flynn. Eng. & Min. Jl., vol. 109, no. 8, Feb. 21, 1920, pp. 487-489, 1 fig. Present methods of treatment are discussed and process is suggested for recovering lead by electrolytic means.

Reinforced. Reinforced Lead, Charles Baskerville and C. M. Wales. Chem. & Met. Eng., vol. 22, no. 23, June 9, 1920, p. 1081, 5 figs. Lead suspended in large sheets or pipes is said to creep or sag so that it must be held in position and frequent supports are necessary to hold lead in place. Many troubles in use of lead, it is stated, have been overcome or diminished by reinforcing lead with iron or steel wire gauze or perforated sheets, which are imbedded within the lead according to U. S. patent. Account of experimental work on such material carried out by V. A. Belcher, College of City of New York.

LEAD CHROMATE

Experimental Work. Chromate of Lead (Ueber Bleichromat), Max Gröger. Zeitschrift für anorganische u. allgemeine Chemie, vol. 109, nos. 3-4, Jan. 16, 1920, pp. 226-234. Results of experiments at the chem. laboratory of Nat. Indus. School of Vienna on the precipitation of acetate of lead solutions with alkali chromates.

LEAD METALLURGY

Australia. Lead-Smelting Practice at Port Pirie, South Australia, Gilbert Rigg. Min. and Sci. Press, vol. 121, no. 3, July 17, 1920, pp. 90-96, 2 figs. Advances in metallurgical practice made during past four years at Broken Hill Associated Smelters Proprietary, Ltd. Main elements in development of roasting and smelting practice which has been carried on along the line of simplification of methods.

Dry-Process Losses. Losses in Dry Lead and Zinc Processes, K. Friedrich. Metal Industry, vol. 15, no. 20, Nov. 14, 1919, pp. 405-407. Points out possible fields of scientific investigation. Translated from Metall und Erz.

Roasting and Smelting. Roasting and Lead-Smelting Practice at the Port Pirie (S. A.) Plant of the Broken Hill Association Smelters Proprietary, Ltd., Gilbert Rigg. Bul. of Instn. of Min. & Metallurgy, no. 188, May 1920, 15 pp. Experiments which led to adoption of double Dwight-Lloyd method.

LEAD ORE

Coeur d'Alene, Idaho. The Occurrence of Bindheimite as an Ore Mineral, Earl V. Shannon. Economic Geology, vol. 15, no. 1, Jan.-Feb. 1920, pp. 88-93. Specimens found in Coeur d'Alene district, Idaho, are believed to represent sulphantimonites other than tetrahedrite and to have formed by reaction between lead compounds in solution and antimonial mineral in place.

German Industry. The Lead and Zinc Ore Trade

in Germany (Der Handel mit Blei- und Zinkerzen in Deutschland), H. Schnass. Metall u. Erz, vol. 17, nos. 2 and 3, Jan. 22 and Feb. 8, 1920, pp. 27-34 and 61-75. Notes on the German lead and zinc industry, and conditions up to outbreak of war. An appendix discusses application of price-calculating formulæ in connection with the altered war conditions.

LEAD OXIDE

Volatilization of. The Volatilization of Lead Oxide from Lead Silicate Melts, Olaf Andersen. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 784-789, 1 fig. Experiments were made on amount of PbO volatilized from surface of lead silicate glasses at temperatures from 900 to 1400 deg. cent. It was found that volatilization from unstirred glass in 15 min. took place at practically same rate as from stirred glass heated for longer period.

LEAD PIPE

See PIPE, LEAD.

LEAD PLATING

See ELECTROPLATING, Lead Plating.

LEATHER

Area Measurement. Area Measurement of Leather, Frederick J. Schlink. Technologic Papers of Bur. of Standards, no. 153, 47 pp., 16 figs. Principles of design involved in leather-measuring machines are set forth with respect to kinds in common use. Analysis is made of sources of serious errors which commonly exist in commercial leather-measuring machines of the wheel type, and attention is called to the fact that a number of sources of error definitely favor overmeasurement, so that, on the whole, common leather-measuring machines will tend to measure constantly in excess.

Cutting and Embossing. See PRESSES, Leather-Cutting Tools for.

Physical Properties. Effects of Oils, Greases, and Degree of Tannage on the Physical Properties of Russet Harness Leather, R. C. Bowker. Technologic Papers, Bur. of Standards, no. 160, April 17, 1920, 18 pp., 19 figs. Amount of stuffing content was found to affect tensile strength of leather, and a point was determined beyond which amount of stuffing content used did not add to strength but actually served to decrease it. Tensile strength was greater for leather tanned a short time than for leather given a long time tannage.

Sole, Effect of Glucose on. Effects of Glucose and Salts on the Wearing Quality of Sole Leather, P. L. Wormeley, R. C. Bowker, R. W. Hart and L. M. Whitmore. Dept. Commerce, Technologic Papers, Bur. of Standards, no. 138, Oct. 6, 1919, 38 pp., 24 figs. No indication was found that addition of glucose and salts is either beneficial or detrimental to durability of leather. It is said that greater part of added glucose and salts is lost from leather during wear, while other water-soluble materials appear to be retained in leather.

LEATHER INDUSTRY

Research. The Leather Industry, John Arthur Wilson. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 457-460, 4 figs. Points out that many problems awaiting solution in such phases of leather manufacture as unhairing, deliming, bating, tanning, stuffing and dyeing involve fundamental scientific principles which can best be studied through cooperation between university and tannery chemists.

LENSES

Chromatic Deviation. Dependence of the Chromatic Deviation of a Lens System on Lens Radius (Ueber die Abhängigkeit der chromatischen Abweichung eines Linsensystems von einem Linsenradius), H. Erfle. Zeitschrift für Instrumentenkunde, vol. 39, no. 8, Aug. 1919, pp. 233-241, 2 figs. It is explained that semi-chromatic lens systems form link between achromatic and simple (chromatic) system.

See also OPTICS, Astigmatism.

LEVEES

Mississippi River. Levee Construction on Mississippi and Its Effect on River Section, C. McD. Townsend. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, pp. 36-38, 2 figs. Sections generally employed are represented as insuring angle of repose of dry earth on wet clay of 14 deg. when water is at top of levee, which is limiting angle for such materials. Upon comparing Mississippi levees with European practice it is found that European levees have a greater width of crown and steeper land slopes but about same width of base.

Settlement of. Levee Settlement: Causes and Remedies. Eng. & Contracting, vol. 53, no. 24, June 16, 1920, pp. 675-677. Causes for subsidence are summarized as (1) physical defects in substrata or foundation due to local conditions; (2) narrow berms; (3) deep borrow pits; (4) manner of placing and distributing material in embankment. Remedies are suggested. From report of Board of State Engrs. of Louisiana.

[See also RIVERS, Levee Construction, Dayton, Ohio.]

LEVELING

Errors. Surveyor's Level and Topographical Circles (Des niveaux à lunette et des cercles topographiques), H. Van Hyfte. Annales des Travaux publics de Belgique, vol. 20, no. 4, Oct. 1919, pp. 533-551, 1 fig. How to determine experimentally errors of observations, errors of contact and residual errors of calculations.

LEVERS

Hand. See HAND LEVERS.

LIBERTY MOTORS

Assembling. How Ford Built Liberty Motors, Fred H. Colvin. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1037-1041, 24 figs. Notes specially assembling operations.

LIBRARIES

Factory. Teaching Library Aid to Industry, John S. Thorp. Iron Trade Rev., vol. 66, no. 21, May 20, 1920, pp. 1480-1482, 5 figs. Describes libraries maintained by General Electric Co., the Studebaker Corp., and the Phelps Dodge Corp., for the use of their employees.

Heating. See HEATING AND VENTILATION, Public Library, St. Paul.

LIFEBOATS

Motor-Driven. The Development of the Motor Lifeboat. Engr., vol. 129, no. 3351, Mar. 19, 1920, pp. 294-296, 6 figs. Comparison of self-righting and non-self-righting types.

LIFTING MAGNETS

Types. Lifting Magnets (Les électro-aimants de levage), P. Pusard. Fonderie Moderne, vol. 12, no. 8, Aug. 1919, pp. 184-187, 7 figs. Construction and operation of various types.

[See also CRANES, Traveling.]

LIGHT

Absorption and Fluorescence. Light Absorption and Fluorescence, E. C. C. Baly. Lond., Edin-

burgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 235, July 1920, pp. 1-31, 2 figs. Consideration of quantitative relationships between various frequencies exhibited by substances in light of energy quantum theory; conclusions given are said to lead to exact and rigid relationships as regards energy changes suffered by a molecule, which seem to be free from that vagueness so often associated with attempts to apply energy quantum theory. Discussion of affinity of atoms for one another which causes reaction to take place.

Absorption by Gases. Absorption of Light by Gases (Contribution à l'étude de l'absorption de la lumière par les gaz), G. Ribaud. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 107-226, 22 figs. Study of continuous absorption of brome vapor in ultraviolet under various conditions of vapor and at temperatures up to 620 deg. cent.

Diffusion. Diffusion of Light by Rain, Cloud or Fog, A. Mallock. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 267-272. Data showing effect of shower or cloud in obscuring direct light of distant source.

Reflection. Diffused Reflexion and Transmission of Light, A. P. Trotter. Illuminating Engr., vol. 12, no. 9, Sept. 1919, pp. 243-267, 54 figs. It is shown how specular reflexion can be separated from diffused reflexion by drawing internal osculating circle, instead of circumscribing circle of Bouguer and Blondel.

The Minimum of Regular Reflection (Minimalstellen der regulären Reflexion), Felix Jentzsch-Gräfe. Berichte der deutschen physikalischen Gesellschaft, vol. 21, nos. 11-12, June 30, 1919, pp. 361-368, 3 figs. It is pointed out that for refraction indices greater than 3.732 the minimum reflection does not lie in the vertical angle of incidence, but in other angles which, however, are always less than the polarization angle; and minimum of reflected intensity lies always between one-third and one-half of angle of incidence.

Refraction. On Terrestrial Refraction, A. R. McLeod.. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 546-568, 7 figs. Refraction of light rays of various length and zenith distances by atmosphere is dealt with and errors in Chauvenet dip range formula are considered. Report communicated to Advisory Committee for Aeronautics, England.

The Scattering of Light in the Refractive Media of the Eye, C. V. Raman. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 568-572. Examination of Helmholtz explanation of luminous streamers observed when small and intensely luminous source of light is viewed directly by eye against dark ground.

Signaling with. See SIGNALING, Light, Speed by Use of.

Transmission through Atmosphere. Relative Spectral Transmission of the Atmosphere, Enoch Karrer and E. P. T. Tyndall. Dept. of Commerce, Sci. Papers of Bur. of Standards, no. 389, July 21, 1920, pp. 377-408, 20 figs. Transmission of atmosphere was studied with a view to determining data useful for aerial photography and use of light projectors for automobile and locomotive head-lamps, for signaling and as beacons, and for searching on land, water and in the air.

LIGHTHOUSES

Aerial. Aerial Lighthouses. Engr., vol. 129, no. 3359, May 14, 1920, pp. 500-501, 4 figs. Description of lights designed by Chance Bros. & Co., Ltd., of Smethwick, Birmingham, one of which is a fixed section light and has a range of 5 to 10 miles; the second has lower portion of optical part consisting of six panels of revolving section prisms, while upper portion comprises six panels of special section prisms; the revolving parts are driven by a spring clockwork device, the illuminant is acetylene fed to incandescent mantles.

High-Power. High-Power Lighthouse with Metal Reflectors (Phare de grand atterrage, avec optique à réflecteurs métalliques), Jean Rey. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 10, Sept. 8, 1919, pp. 471-473. Each of four bronze reflectors is fourth part of parabolic reflector of 2.25 m. in diameter and 0.65 m. focal distance. These four reflectors are mounted on special base which permits a complete revolution to be effected in 20 sec.

LIGHTING

Accident Prevention through. See ACCIDENT PREVENTION, Lighting, Value in.

Arc vs. Incandescent Lamps. Comparative Cost of Lighting by Arc and by Incandescent Lamps (Coüt comparatif de l'éclairage par arc et par incandescence), M.-H. Dupont. Bulletin mensuel de la Société belge des Electriciens, vol. 34, no. 4, Aug. 1920, pp. 157-172. Total cost, including installation and maintenance, is determined to be smaller for incandescent lamps. Installations considered are principally those in industrial works.

Armories and Gymnasiums. The Illumination of Armories and Gymnasiums, A. L. Powell and A. B. Oday. Elec. Rev. (Chic.), vol. 76, no. 24, June 12, 1920, pp. 969-975, 4 figs. Results of investigations of typical installations, with recommendations.

Candlepower Required. Relation of Lighting Feeders to Watts per Square Foot, Victor Tousley. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 686-687. Tables showing actual demand factors in units per square foot used in different classes of business and industry.

Churches. The Artificial Lighting of Churches, John Darch. Illuminating Engr., vol. 13, no. 5, May 1920, pp. 142-157 and (discussion) pp. 157-163, 21 figs. Engineering technique and artistic aspect of problem are discussed and rules for church lighting are formulated.

Coal Mines. See COAL MINES, Lighting.

Codes. Symposium Application of Industrial Lighting Codes. Trans. Illuminating Eng. Soc., vol. 14, no. 9, Dec. 31, 1919, pp. 435-499, 5 figs. Administration of industrial lighting codes in Wisconsin, New York, New Jersey and Pennsylvania are outlined and federal rules for industrial lighting and eye protection are quoted.

Coefficients of Utilization. Coefficients of Utilization, Ward Harrison and Earl A. Anderson. Trans. of Illuminating Eng. Soc., vol. 15, no. 2, March 20, 1920, pp. 97-123, 38 figs. Method is presented for direct determination of coefficients of utilization applying to installations of all ordinary types of lighting units in rooms of varied proportions and different ceiling and wall colors. As basis for method, coefficient of utilization data are tabulated from series of several hundred illumination tests made in experimental room with reflectors having three fundamental forms of light distribution. Illustrating application of data presented, typical coefficient of utilization tables, as determined for number of reflector types in common use, are included.

Walls and Floors—Their Effects on Lighting, Van Rensselaer Lansingh. Trans. of Illuminating Eng. Soc., vol. 15, no. 2, March 20, 1920, pp. 124-135 and (discussion) pp. 135-138, 9 figs. Utilization factors are given in different units of direct, semi-indirect and totally indirect types designed for gas-filled lamp when tested under varying conditions of

walls and floor. Effects of variable wall and floor coverings are analyzed and their interaction explained.

Color Matching, Light for. Artificial Daylight, A. P. Trotter. Times Eng. Supp., no. 542, Dec. 1919, p. 361. Concerning matching of colors.

Colour-Matching by Natural and Artificial Light, L. C. Martin. Illuminating Engr., vol. 13, no. 2, Feb. 1920, pp. 31-42 and (discussion) pp. 43-59, 15 figs. Methods devised for color-matching are surveyed and compared. Reference is specially made to a system in which a double-tinted reflector is used in conjunction with a metal-filament lamp so constructed as to throw practically all its light on to the shade above it. It is said that this system has been successfully used for painting at night.

Corona Lamps. Gaseous Conduction Light from Low-Voltage Circuits, D. McFarlan Moore. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 8, August 1920, pp. 733-742, 32 figs. Tests showed that efficiency of Corona lamps is the same whether operating on a-c. or d-c. circuits and the same on a-c. circuits over wide voltage range and wide range of intensities. Candle power was found to be greater with radiators of large area, and power factor to be about 85 per cent.

Daylight Measurement. The Measurement of Daylight (Das Tageslicht und sein Mass), A. Burchard. Schweizerische Bauzeitung, vol. 76, no. 7, Aug. 14, 1920, pp. 73-77, 6 figs. Writer points out that, as in the case of calculation of artificial light, the required light radiation must be determined for each room according to its size and conditions, and in plan of house, windows must be arranged so as to permit the penetration of this light. Example is given of the practical carrying out of such calculation.

Daylight Saving. Daylight Saving, Preston S. Millar. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 146-158, 13 figs. It is estimated that annual saving in United States of $19,250,000 could be effected by daylight saving, but as economic losses resulting in consequence of interference with agriculture, dairying and truck gardening are valued at over $1,000,000,000, it is concluded that solution of problem lies in diversification of hours of industry.

Design of System. Designing Direct and Indirect Illumination, M. M. Samuels and C. O. von Dannenberg. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 721-724, 9 figs. Practical method of determining illumination in given plane for either direct or indirect fixtures and original scheme of calculating foot-candle in one horizontal plane from values obtained in another.

Diffuse Reflection. An Absolute Method for Determining Coefficients of Diffuse Reflection, F. A. Benford. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 72-76, 6 figs. It is called absolute because no photometric standards are involved, brightness measurements being made with uncalibrated lamps and unknown instrument constants.

Electricity from Sewage Gases. See SEWAGE DISPOSAL, Gases, Utilization of.

Factory. Developments in Electric Lamps for Shop Use. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 821-824, 13 figs. Reference is made to use of new type C tungsten lamp and its increase in efficiency over older types of tungsten units. Examples of shop lighting by mercury-vapor lamps and by Mazda C lamps are illustrated by night views under artificial light.

Factory Lighting—A Central Station Problem, O. R. Hogue and J. J. Kirk. Trans. Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 46-53 and (discussion) pp. 54-60, 10 figs.; also Elec. Rev. (Chicago), vol. 75, no. 18, Nov. 1, 1919, pp. 725-729, 4 figs. Data are given of a number of installations of Commonwealth Edison Co. during past year, which show tendency to improvement of artificial lighting. Data on income of central station are also included.

Good Lighting Aids Production, Ward Harrison. Iron Trade Rev., vol. 65, no. 25, Dec. 18, 1919, pp. 1637-1641, 5 figs. Tests conducted to find relation of lighting and production are said to have shown that substitution of proper lamps and reflectors for antiquated equipment increased output by from 2 to 35 per cent. Paper read before Soc. of Indus. Engrs.

High Intensity Factory Illumination, M. A. Smilari. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1428-1431, 5 figs. Economic and social effects. Specifications for artificial sources of light. Range of intensities for various kinds of work.

Lighting Fixtures for Shop Illumination, C. E. Clewell. Am. Mach., vol. 51, no. 16, Oct. 16, 1919, pp. 727-731, 14 figs. Features for minimizing glare of Mazda gas-filled lamps.

Shop Lighting, C. W. Price. Bul. Dept. of Labor & Industry, vol. 7, no. 4, 1920, pp. 39-44. Suggested standardization.

Shop Protective Lighting, C. E. Clewell. Am. Mach., vol. 51, no. 18, Oct. 30, 1919, pp. 785-788, 7 figs. Discusses question of lighting yards and building fronts as protective measure, and advantages of night lighting for yard areas, loading platforms and similar places.

Survey of Prevailing Conditions as to Industrial Lighting. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 180-183, 7 figs. Technical and commercial data gathered from visit to 450 plants in 57 cities located in 15 of leading industrial states.

Farm Lighting System. Knight Engine Adapted to Two-Unit Farm Lighting System. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 14-17, 5 figs. Spherical combustion chamber is notable feature of this air-cooled motor.

Flood. Flood Lighting of the Horseshoe Falls. Elec. News, vol. 28, no. 21, Nov. 1, 1919, pp. 29-30, 4 figs. Plans of illumination installation which contains over ninety 1000-watt lamps.

Glare, Measurement of. Glare Measurements, Ward Harrison. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 34-45, 3 figs. Data are presented showing range of agreement in opinion among number of observers as to glare from bare lamps and other more diffuse light sources, in comparison with reference, source of variable intensity. Practicability of rough classification of lighting installations into groups according to sensation of glare as registered by small instrument based on this method of comparison, is discussed.

Illumination Intensity. Predetermining Foot-Candle Illumination, I. W. Gross. Elec. World, vol. 75, no. 25, June 19, 1920, pp. 1423-1425, 2 figs. Chart for determining vertical illumination on horizontal plane at any distance below center of light from 2 ft. up to 100 ft. and along horizontal plane up to distance of 300 ft. on each side of unit.

Indirect. Artistic Lighting of a Large Interior, J. R. Cravath. Elec. World, vol. 75, no. 17, April 24, 1920, pp. 939-941, 4 figs. Indirect lighting of dome, 200 ft. in diameter, in hotel. Eighteen 1000-watt lamps are used.

Illumination of Artistic Interiors Without the Use of Pendant Ceiling Fixtures, Augustus D. Curtis and J. L. Stair. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920,

pp. 61-73 and (discussion) pp. 73-76, 14 figs. Examples of indirect lighting are illustrated, notably in American Theatre of Chicago, National Bank of Commerce, New York, and Hotel Commodore Lobby, New York.

Industrial. A Survey of Industrial Lighting in Fifteen States, R. O. Eastman. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 77-93 and (discussion) pp. 93-96, 17 figs. Based on visits to representative plants.

Notes on Industrial Lighting, Otis L. Johnson. Elec. Jl., vol. 17, no. 5, May 1920, pp. 198-201, 9 figs. Cost of efficient industrial lighting is investigated and it is found that good illumination can be installed and operated for less than 1 per cent of average workman's wages.

The RLM Standard Reflector for Industrial Lighting, Ward Harrison. Trans. of Illuminating Eng. Soc., vol. 15, no. 6, Aug. 30, 1920, pp. 374-384, 11 figs. Photometric distribution curves.

See also Codes; Factory; Textile and Clothing Industries.

Interior Systems, Improving Illumination. Maintenance of Interior Lighting Systems, Ward Harrison and J. R. Colville. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 204-208, 7 figs. Case is cited where it is said illumination was raised from 2.7 to 7 foot-candles by cleaning lamps, reflectors, walls and ceiling.

Line Work. Illumination for Line Work to be done at Night, B. J. Schwendt. Telegraph & Telephone Age, vol. 37, no. 21, Nov. 1, 1919, pp. 524-525, 4 figs. Outfit consists of Ford gas headlight lamp equipped with special carrying handle and supporting base welded into one frame, so that lamp can be removed by loosening set-screws.

Machine Tools. Electric Lighting of Machine Tools (Die elektrische Beleuchtung von Werkzeugmaschinen), Heinrich Müller. Elektrotechnischer Anzeiger, vol. 36, nos. 59 and 60, June 15 and 17, 1919, pp. 269-270 and 275-276. Proper lighting said to be necessary to increase quality of production and to reduce accidents.

Parks. Cost Problems in the Lighting of Public Parks, C. H. Shepherd. Elec. Rev., vol. 77, no. 11, Sept. 11, 1920, pp. 389-394, 8 figs. Methods used in replacement of old arc-lighting equipment with type C lamps at Lincoln Park, Chicago. Reduction in cost resulting from change.

Power Houses. The Lighting of Power Houses, A. D. Bell. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 885-887, 6 figs. Requirements for various services and means by which they may be fulfilled.

Railway Stations. Report of Committee VI.—On Buildings. Bul. Am. Ry. Eng. Assn., vol. 21, no. 220, Oct. 1919, pp. 123-138, 4 figs. Proposes standards of illumination for passenger-station interiors and surroundings and platforms, covered and uncovered.

Railway-Train. See TRAIN LIGHTING.

Reflection Factor, Measurement of. A New Portable Reflectometer, A. H. Taylor. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 467-469, 2 figs. Device for measuring diffuse reflection factor of walls by means of portable photometer and integrating photometric sphere.

Reflectors. See REFLECTORS, Luminous Intensity.

Residence. Daylight Illumination of Rooms (Die Beleuchtung des Zimmers durch Tageslicht). Zentralblatt der Bauverwaltung, vol. 40, no. 35, May 1, 1920, pp. 218-219, 9 figs. From abstract published in De Bauwwereld (Amsterdam, Nov. 5 and 12, 1919) of a report from the Hague Municipal Bur. for Buildings and Dwellings on investigation of daylight illumination of rooms in a three-story house 12 m. high on street 12 m. wide.

Electric Service in the American Home. Elec. World, vol. 75, no. 20, May 15, 1920, pp. 1133-1137, 2 figs. It is noted from study of reports from more than 5000 central stations that 30.7 per cent of people in United States live in electrically lighted homes. Houses wired amount to 6,291,160, and farm-lighting plants to about 340,000.

Home Lighting—How to Make It Comfortable and Effective, A. L. Powell and R. E. Harrington. Trans. Illum. Eng. Soc., vol. 14, no. 8, Nov. 10, 1919, pp. 394-406 and (discussion) pp. 407-414, 8 figs. Concerning avoidance of extreme contrasts and arranging lights so as to derive greatest flexibility of lighting.

Safety Orders. Practical Application of General Lighting Safety Orders, R. L. Eltringham. Jl. of Elec., vol. 45, no. 2, July 15, 1920, pp. 65-66. Lighting industrial buildings; emergency lighting.

Schools. Good Lighting in the Schools, F. C. Caldwell. Trans. Illuminating Eng. Soc., vol. 15, no. 5, July 20, 1920, pp. 321-332 and (discussion) pp. 332-336. Code of Lighting School Buildings, put out by Committee on Lighting Legislation of Illuminating Eng. Soc. is recommended as "the best available authority on the principles of school lighting."

See also VENTILATION, Schoolrooms.

Shadowless. Shadowless Illumination (Le scialytique, appareil d'éclairage sans ombres portées), A. Breton. Nature (Paris), no. 2390, Jan. 17, 1920, p. 48, 2 figs. Apparatus invented by L. Vérain. Light from lamp placed at focus of Fresnel cylindrical lens is reflected downward by reflector formed of trapezoidal mirrors inclined at suitable angle.

Shop. See Factory.

Street. Automatic Switching and Control of Electric Street Lighting in Charlottenburg (Berlin) (Die Fernschaltung und Fernüberwachung der öffentlichen Beleuchtung in Charlottenburg), W. Jordan and J. Kuhlo. Elektrotechnische Zeitschrift, vol. 41, no. 1, Jan. 1, 1920, pp. 8-11, 9 figs. The arrangement of the automatic switch and control plant is described and a comparison is made between costs of operation of hand and automatic switching.

Constant Potential Series Lighting, Chas. P. Steinmetz. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 245-248. Comparison of three types of high-voltage street-lighting systems: constant-current series, constant-potential series, and constant-potential multiple systems.

Development of the Chicago Street-Lighting System, William G. Keith. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 39-41. Installation and operation of series group systems. Paper read before Internat. Assn. of Mun. Elecns.

Developments in Street Lighting Units (Electric), A. D. Cameron and C. A. B. Halvorson. Trans. Illuminating Eng. Soc., vol. 15, no. 3, Apr. 30, 1920, pp. 163-168 and (discussion) pp. 168-174. Increased adoption of Mazda lamp is recorded. It is urged, however, that candlepower should not be reduced to sizes giving intensities unfit for good street lighting.

Intensive Street Lighting, W. D'Arcy Ryan. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 362-373, 12 figs. Details of "intensive white way" system of illumination installed in principal streets of various cities.

Multiple Systems of Distribution for Street Lighting, Ward Harrison. Jl. Am. Inst. Elec.

Engrs., vol. 39, no. 1, Jan. 1920, pp. 7-12, 10 figs. Describes briefly various devices in use or proposed for control of multiple street lamps and outlines characteristics desirable in such apparatus. Calls attention to small differences in efficiency of present multiple and series incandescent lamps.

Recent Developments in Gas Street Lighting, F. V. Westermaier. Trans. Illuminating Eng. Soc., vol. 15, no. 3, Apr. 30, 1920, pp. 175-182 and (discussion) pp. 182-184, 7 figs.; also Am. City (Town & County Edition), vol. 22, no. 5, May 1920, pp. 490-492, 3 figs. Attention is directed to developments in maintenance practice. Fixtures are illustrated and a table is given showing illuminating powers of different lamps used.

Regulation of Street Series Lamps in Practice on Milwaukee's System, F. A. Vaughn. Jl. Western Soc. of Engrs., vol. 25, no. 11, July 20, 1920, pp. 374-403, 29 figs. Scheme of connections and records of operation.

Single Light Compared with Cluster Units for Street Lighting, S. L. E. Rose and H. E. Butler. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1044-1055, 16 figs. Writers point out what they term inefficiency of cluster unit and present data in support of their contention that this type of unit should be discarded.

Street Lighting with Low Mounted Units. Kenisco Dam Roadway, C. A. B. Halvorson and A. B. Oday. Trans. Illuminating Eng. Soc., vol. 15, no. 3, Apr. 30, 1920, pp. 153-162, 10 figs. Specifications for units for lighting roadway on Kenisco Dam, New York City waterworks, are quoted and application of units used there to street lighting is discussed.

Tendencies in Ornamental Street Lighting, L. A. S. Wood. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 324-325, 1 fig. Parkway system is discussed and suggestions regarding installation are made.

The Series System of Street Lighting Distribution, W. P. Hurley. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 1-6, 8 figs. Advantages of series systems of street-lighting distribution are claimed to be effectiveness, simplicity of control and high electrical efficiency of lines and lamps. High cost of line per dollar of income, high voltage and use of special lamps, are quoted as disadvantages.

See also SUBSTATIONS, Automatic.

Textile and Clothing Industries. Some Notes on Lighting in the Textile and Clothing Industries, J. S. Dow. Elecn., vol. 84, no. 2181, Mar. 5, 1920, pp. 260-263, 9 figs. Matters connected with intensity and distribution of light are considered and effect of color in illuminant is discussed.

Theaters. Artistic and Utilitarian Theater Lighting, Lyman Day Morgan. Elec. World, vol. 75, no. 1, Jan. 3, 1920, pp. 4-6, 7 figs. Scheme of concealed light sources at Milwaukee theater.

Lighting the World's Largest Theater. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 776-779, 9 figs. Electric fixtures used for lighting Capitol Theater, New York City, which has seating capacity of 5300.

Remote Control for Theater Lighting. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 747-749, 5 figs. Flexibility, speed, noiselessness, lower cost, less space and safety said to be combined in a rebuilt installation at Chicago. Switches for any scene set in advance and operated by master switch.

Village Communities. Lighting for Country Homes and Village Communities, Wm. Kuerth. Official Publication Iowa State College Agriculture & Mechanic Arts, vol. 18, no. 19, Oct. 8, 1919, 32 pp., 26 figs. Necessity for better light in village communities is emphasized by statement that New York State Health Department has found that while 21 per cent of country school children have defective vision, only five per cent of city school children are so afflicted. Schemes of illumination for such communities are suggested and their comparative costs indicated.

[See also ILLUMINATION.]

LIGHTNING ARRESTERS

Alternating-Current. Alternating-Current Lightning Arresters, V. E. Goodwin. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 429-432, 8 figs. Survey of developments with special reference to aluminum-cell and oxide-film arrester.

High-Speed. Lightning. The Effect of Lightning Voltages on Arrester Gaps, Insulators and Bushings on Transmission Lines, F. W. Peek, Jr. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 900-906, 14 figs. Writer calls attention to necessity to produce lightning arresters of very high speed if steep wave front impulses are to be removed before damage is done to apparatus, bushings and other equipment. He then proceeds with analysis of relative speeds of different forms of gaps and shows variation in discharge value for any gaps under 60-cycle and lightning voltages and under wet and dry conditions.

Horn Gaps. Protection of Electric Installations Against Atmospheric Discharges and Overvoltages (Protection des installations électriques contre les décharges atmosphériques et les surtensions), A. Hayet. Revue générale de l'Electricité, vol. 7, no. 20, May 15, 1920, pp. 657-664, 15 figs. Theory of horn gaps and suggestions in regard to manner of installing horn-gap lightning arresters.

Surge Arrester. Protecting from Abnormal Voltages, C. E. Bennett. Elec. World, vol. 75, no. 7, Feb. 14, 1920, pp. 365-368, 6 figs. Account of construction and operation of a surge arrester designed to protect generating and transmission systems from abnormal potentials caused by lightning, switching, arcing grounds, etc.

LIGNITE

Briquetting. Advantages of Coal-Handling Equipment for Use Over the Drying Apparatus in Lignite Briquetting Works (Ueber die Wirtschaftlichkeit einer Zuführungsvorrichtung auf den Kohlenböden über den Trockenapparaten in Brikettfabriken), Otto Schuster. Braunkohle, vol. 18, no. 49, Mar. 6, 1920, pp. 653-654. Describes Schuster apparatus used successfully in number of works with which it is possible to obtain increased and regular amount of dried product, and which prevents bulging and heaping of coal above the opening for receiving coal in drying apparatus.

Carbonization, Low-Temperature. Low-Temperature Carbonization of Low-Grade Fuels, Particularly of Lignite (Die Tieftemperaturverkohlung geringwertiger Brennstoffe, insbesondere der Braunkohle), Ernst Wolff. Braunkohle, vol. 19, no. 3, May 1, 1920, pp. 41-42. Writer tells of his experiments with the distillation of garbage at a temperature of 450 to 550 deg. cent. and of low-grade Bavarian lignite at a temperature of 370 deg. cent., whereby a high grade of gas was obtained.

Conveying Equipment. The Coal-Conveying Plant of the Goldenberg Central Station (Die Kohlentransportanlagen des Goldenberg-Kraftwerks), H. Hermanns. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 42, no. 50, Dec. 12, 1919, pp. 385-388, 5 figs. Pohlig conveying

equipment of large central station employing lignite fuel.

Distillation of. Experiments on the Distillation of Lignites and of Mixtures of Lignite and Anthracite (Orientierende Versuche über die Entgasung von Braunkohle und Braunkohle-Steinkohle-Mischungen), A. Viehoff and E. Czakó. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 24, June 12, 1920, pp. 279-383, 4 figs. Results of proximate analysis, calorimetric investigation and elementary analysis of four specimens of lignite, smoldering tests of three specimens of anthracite, and distillation tests of mixtures of lignite and anthracite. It is concluded that it is better to distill lignite and anthracite separately.

Drying Apparatus. New Types of Tubular Drying Apparatus for Lignite (Neuerungen an Röhrentrocknern für Braunkohle), H. Jordan. Feuerungstechnik, vol. 8, no. 11, Mar. 1, 1920, pp. 95-96, 8 figs. Describes method of preventing choking up of tubes by removal of impurities and large pieces immediately before stoking; a hopper for preventing the coal from falling out of tube openings; tube with reversing plate; drying apparatus with drainage device, etc.

Gasification of. The Gasification of Lignite in Modern Gas Producers with Revolving Grates (Die Vergasung von Braunkohle in neuzeitlichen Drehrost-Gaserzeugen), Kurt Neumann. Stahl u. Eisen, vol. 39, no. 42, Oct. 16, 1919, pp. 1233-1239. Account of operation tests on two revolving-grate producers which deliver heating gas for a zinc works and each of which consume from 20 to 25 tons of Bohemian lignite daily. Results of experiments are critically discussed and compared with results of tests on other producers.

Germany, Utilization in. The Utilization of Lignite Mines for Alleviation of the Coal Famine (Die Heranziehung des Braunkohlenbergbaues zur Linderung der Kohlennot), H. Kegel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 6, Feb. 7, 1920, pp. 125-129, 4 figs. States that the German lignite fields contain more than 15 billion tons. The low heat value necessitates production of rich briquets from dry raw lignite; along with recovery of low-temperature tar, lignite coke can be recovered which is said to be a valuable house fuel.

Mining. Apparatus for Handling Lignite in Surface Mining (Braunkohlenförderbahen), W. Metz. Fördertechnik u. Frachtverkehr, vol. 13, no. 1, Jan. 9, 1920, pp. 4-7, 10 figs. Describes improvements in excavating and transporting which have reduced costs of operation.

See also EXCAVATING MACHINES, Germany; MINE HOISTING, Bucket Elevators for.

Tar from. See TAR, Production from Lignite.

Utilization. Revolving Kiln for Making Lignite into Made-to-Order Fuel, E. L. Broome. Coal Age, vol. 17, no. 21, May 20, 1920, pp. 1046-1048, 1 fig. Experiments, it is said, have demonstrated that revolving kiln can be so regulated as to deliver semi-coke, gas and by-products.

[See also BOILER FIRING, Pulverized Lignite; COAL MINES, Open-Pit, Lignite; FUELS, Lignite; Wood and Lignite.]

LIME

Hydrated. Test Data on Lime in Concrete and Mortar, Tyrrell B. Shertzer. Nat. Lime Assn., bul. no. 303, 1920, 19 pp., 4 figs. Study of certain tests and experiments upon effects of hydrated lime when added to concrete mixtures under varying conditions and for various purposes, together with comments and field observations.

Hydrated Lime Plants. New Lime Plant Being Constructed at Luckey, Ohio, R. R. Bour. Cement, Mill & Quarry, vol. 16, no. 10, May 20, 1920, pp. 23-24, 2 figs. Plant will have six "Arnold" kilns with capacity of 150 tons of high-grade finishing hydrated lime daily.

The Hydrated Lime Plant at Genoa, Ohio, of the U. S. Gypsum Company, Curtis F. Columbia. Rock Products, vol. 22, no. 24, Nov. 22, 1919, pp. 30-32, 5 figs. Capacity of plant is 200 tons. Operation of Schaffer hydrator is illustrated.

Producer Gas-Fired Kilns. Home-Made Gas Producers Increase Lime Burned Per Unit of Fuel 50 per cent. Rock Products, vol. 22, no. 23, Nov. 8, 1919, pp. 37-40, 12 figs. Experience of company after replacing coal-fired furnaces with semi-gas producers.

Properties and Uses. Lime: Its Properties and Uses. Dept. of Commerce, Bur. of Standards, no. 30, July 6, 1920, 25 pp. Suggestions in regard to testing of lime for purchase are also included.

Specifications. Recommended Specifications for Quicklime and Hydrated Lime for Use in the Cooking of Rags for the Manufacture of Paper. Dept. of Commerce, Bureau of Standards, Circular no. 96, June 15, 1920, 5 pp. General facts, followed by discussion of requirements of lime and sampling and testing.

LIMESTONE

Australia. Limestone for Newcastle Steel Works. Commonwealth Engr., vol. 6, no. 9, Apr. 1, 1919, pp. 274-280, 8 figs. Description of quarrying, crushing, handling and storage in Australian works. Face worked is 300 ft. long with average height of 30 ft. and maximum height of 50 ft.

LIMITS

Application to Practice. "Limits" and Their Application to Practice, W. Grocock. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 739-742, 4 figs. Touches on question of placing limits on drawing and discusses just what limits represent, also absolute necessity for an ample supply of cheap gages, as well as importance of rigid and frequent examination of gages.

[See also FITS, Limits for; TOLERANCES.]

LINSEED OIL

See OILS, Linseed.

LIQUID AIR

Explosive Properties. The Use of Liquid Air for Blasting. Colliery Guardian, vol. 120, no. 3114, Sept. 3, 1920, pp. 655-656, 4 figs. Theoretical constants and blasting effects. Experiments on lead cylinders.

Production of. The Production of Liquid Air Rich in Oxygen for Use in Mine Blasting Medium, with Particular Reference to the National Mine-Inspection Plant at Bleicherode (Herstellung von flüssiger Luft mit hohem Sauerstoffgehalt als Sprengmittel in Bergbau unter besonderer Berücksichtigung der bei der staatlichen Berginspektion Bleicherode vorhandenen Anlage), H. Landschütz. Zeitschrift für das Berg- Hütten u. Salinenwesen, vol. 67, no. 4, 1919, pp. 283-296, 5 figs. Calculation of costs for year 1917-1918 is included. Basic principles for selection of the necessary apparatus and machinery are set forth and advantages and disadvantages of various types are critically discussed.

[See also AIR, Liquefaction; EXPLOSIVES, Liquid Air.]

LIQUID FILMS

Soap Bubbles. Soap Bubbles of Long Duration, James Dewar. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919, pp. 713-749, 16 figs. Experimental investigation of physical properties of soap bubbles.

LIQUID FUEL

See OIL FUEL.

LIQUID JETS

Form of. The Form and Breaking Up of Falling Liquid Jets (Gestalt und Auflösung des fallenden Flüssigkeitsstrahles), Robert Scheuermann. Annalen der Physik, vol. 60, no. 3, Oct. 20, 1919, pp. 233-259, 3 figs. Writer explains that as shape of a vertical rising jet is considerably altered by the drops falling after its breaking up, it is not practicable for experimental purposes, and therefore it was decided to make experiments with the vertical falling jet. It is maintained that to certain degree results of experiments confirm Lord Rayleigh's theory of instability of liquid jets. Application of experimental results to Buff theory of jet dissolution.

LIQUIDS

Fall of Bodies in. Accelerated Fall of Bodies in Liquids (Die Fallbeschleunigung der Körper in Flüssigkeiten), K. Kegel. Glückauf, vol. 55, no. 32, Aug. 9, 1919, pp. 613-620. By means of corrected deduction of formula for unrestrained fall of bodies in liquids it was found that obviously every body has a frictional resistance determined by its behavior toward liquid through which it passes, amount of friction depending on moistening capacity, smoothness of surface and viscosity of liquid.

Mixtures, Rectification of. See COLUMN APPARATUS, Glass.

Surface Tension. Surface Tensions and Their Relation to Other Qualities of Liquids (Ueber Oberflächenspannungen und ihre Beziehungen zu anderen Eigenschaften von Flüssigkeiten), W. Herz. Zeitschrift für Physikalische Chemie, vol. 93, no. 5, Sept. 26, 1919, pp. 607-612. In homologous series of organic compounds surface tensions are said to sink with increase of carbon content, while the molecule surfaces become correspondingly greater. It is also pointed out that temperature coefficient of molecular surface energy with equal temperature increases in homologous series with amount of carbon, from which it is concluded that inclination to molecule association of the higher parts of a series is greater than that of the lower parts.

Surface Tension, Measurement of. A Surface Tensimeter for Small Quantities of Liquids, C. C. Kiplinger. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 472-476, 1 fig. Device for measuring surface tension of liquid when only a drop or two of it is available.

Turbulence. See TURBULENCE.

LLOYD'S REGISTER

Operation. The Operations of Lloyd's Register, 1918-1919. Shipbuilder, vol. 21, no. 111, Nov. 1919, pp. 287-293. Together with general surveys of work carried out by Society during war. Also in Iron & Coal Trades Rev., vol. 99, no. 2696, Oct. 31, 1919, p. 566.

LOAD DISPATCHING

See CENTRAL STATIONS, Load Dispatching.

LOCKS

Canal. See CANALS, Locks.

Cylinder. The Cylinder Lock, Ellsworth Sheldon. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 979-983, 5 figs. Master keying system.

Mississippi River, Keokuk. Operating Experiences at the Keokuk Lock and Dry Dock, M. Meigs. Military Engr., vol. 12, no. 62, Mar.-Apr., pp. 192-204, 13 figs. Writer concludes that whole plant has operated for six years with remarkable success, no serious accident has occurred and all machinery has given full satisfaction except the discharge valves of the locks. As now vented to air it is claimed the inlet valves cannot be improved on; the outlet valves, when rebuilt, should have some changes made in better guides for moving sleeve, which involves only slight alterations in present design.

LOCOMOBILES

Compound with Superheater. Compound Locomobile with Superheater. Eng., vol. 109, no. 2840, June 4, 1920, pp. 766-768, 8 figs. Engine is two-cylinder compound mounted on cylindrical tubular boiler. Cylinders are 13 in. and 25 in. in diameter by 22 in. stroke. Valves are of balanced piston type. Engine is built by Messrs. Marshall Sons & Co., Ltd., Gainsborough.

LOCOMOTIVE BOILERS

Boiler Compounds for. Boiler Compounds: Their Nature and Use, W. S. Mahlie. Ry. Mech. Engr., vol. 94, no. 2, Feb. 1920, pp. 71-75. Tables showing quantity of chemicals required to act on various detrimental substances in water and their cost.

Claughton. Boiler for "Claughton" Class Express Engines; Lond., and North Western Railway. Ry. Engr., vol. 40, no. 478, Nov. 1919, pp. 234-238, 6 figs. Principal specifications are: Total heating surface boiler and superheater 2,128 sq. ft.; working pressure 175 lb. per sq. in.; total weight of boiler, 12 tons 2 cwt.

Copper vs. Steel Tubes. Locomotive Boiler Tubes: Copper vs. Steel, Gerard A. Muntz. Ry. Gaz., vol. 32, nos. 18 and 26, Apr. 30 and June 25, 1920, pp. 655-656 and 943-944, 1 fig. First cost of steel tubes is said to be nearer one-half than one-third that of copper. Life of steel tubes is given as 120,000 train-miles, whereas life of copper tubes is put at 360,000 train miles.

Corrosion. Striking Examples of Corrosion of Locomotive Boilers (Su alcune corrosioni caratteristiche che si manifestano nelle caldaie di locomotive), L. Galeone. Rivista Tecnica delle Ferrovie Italiane, vol. 17, no. 1-2, Jan. 15-Feb. 15, 1920, pp. 5-15, 6 figs., partly on 4 supp. plates. Formation of cracks in interior of walls.

Efficiency, British vs. American. Steam Boiler Efficiency, Jas. Dunlop. Engr., vol. 130, no. 3368, July 16, 1920, p. 60. Locomotive-boiler test results obtained in testing plant of St. Louis, Mo. Thermal efficiencies were lower than are realized in British locomotive boilers. This is explained by fact that tube diameters of British boilers are smaller than those of American boilers.

Electric Welding. See ELECTRIC WELDING, ARC, Locomotive Boilers.

Firebox Welding. See WELDING, Locomotive Fireboxes.

Fireboxes, Staybolt Deflection. Deflection of Staybolts, George L. Fowler. Ry. Rev., vol. 65, no. 26, Dec. 27, 1919, pp. 949-953, 8 figs.; also Ry. & Locomotive Eng., vol. 32, no. 11, Nov. 1919, pp. 321-328, 12 figs.; and Ry. Age, vol. 67, no. 23, Dec. 5, 1919, pp. 1088-1094, 13 figs. Experimental determination by actual measurement of amount of relative

movement between inner and outer sheets of locomotive firebox; also general character of motion and manner of its occurrence.

Flue-Tube Joints. Tensile Strength of Various Types of Flue-Tube Joints (Essais à la traction de joints de tuyanterie à lentille et à collarette et de joints mandrinés), M. Bonnin. Revue générale des Chemins de Fer, vol. 39, no. 6, June 1920, pp. 389-393, 6 figs. Tests conducted by Northern Ry. of France.

Superheater Locomotive. Locomotive Boilers. Ry. Engr., vol. 41, no. 485, June 1920, pp. 254-258, 9 figs. Sectional drawings, etc., of large boilers utilized by Lancashire and Yorkshire Ry. Co. on 0-8-0 type superheater locomotives.

Table Grates vs. Finger Grates. Report on Front Ends, Grates and Ash Pans. Ry. Mech. Engr., vol. 94, no. 7, July 1920, pp. 450-452. Report presented to Railway Fuel Association. Describes tests made to determine what, if any, saving could be effected by using table grates in place of finger grates in locomotives burning Gallup coal. Saving was small, considerable loss being due to necessity of replacing finger-grate bars, because fingers burned off.

Tube Costs. Locomotive Boiler Tubes. Ry. Gaz., vol. 32, no. 13, Mar. 26, 1920, pp. 495-496. Table showing cost of tubes for each of 604 engines of London, Brighton & South Coast Railway in copper, brass and steel.

Water-Indicating Devices. Correct Application of Water-Level Indicators in Locomotive Boilers, A. G. Pack. Boiler Maker, vol. 20, no. 9, Sept. 1920, pp. 261-265, 5 figs. Investigations conducted by Bur. of Locomotive Inspection, Interstate Commerce Commission, to determine effect of water circulation on accuracy of indicating devices.

Design and Maintenance of Locomotive Boilers. Ry. Age, vol. 68, no. 24b, June 12, 1920, pp. 1748-1749 and (discussion) pp. 1750-1752. Report of Committee, which recommends presentation of specification covering tubular and reflex water glasses, and bull's-eye glasses for lubricators, and endorses water glasses and gage cocks applied to modern boilers in accordance with method approved by Committee on Standards. From 45 roads making replies to circulars, 27 use tubular water glass, 14 the reflex and 4 report using both. Committee report before Sect. III, Mech. of Am. R. R. Assn.

Government Test of Water-Indicating Devices, A. G. Pack. Ry. Mech. Engr., vol. 94, nos. 9 and 10, Sept. and Oct. 1920, pp. 575-579 and 630-633, 7 figs. Sept.: Account of tests conducted by Bureau of Locomotive Inspection. Tests demonstrated unreliability of many water-indicating appliances on modern locomotives; Oct.: Report of final tests and recommendations submitted by Bureau of Locomotive Inspection.

Improved Water Indicating Devices Necessary. Ry. Age, vol. 69, no. 9, Aug. 27, 1920, pp. 359-362, 4 figs. Account of recent government tests. It was found that gage cocks screwed directly in boiler do not correctly indicate general water level. Water column that is able to afford safest and most practical method for accurately indicating general water level in boiler under all conditions of service is worked out.

[See also STAYBOLTS.]

LOCOMOTIVE TERMINALS

See TERMINALS, LOCOMOTIVE.

LOCOMOTIVES

Accidents, 1919. I. C. C. Locomotive Inspection Report. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 697-699, 6 figs. Annual report of chief federal inspector, in which low water in welded fireboxes is blamed for increase in fatal accidents.

Australian Construction. Australian Locomotive Construction. Boiler Maker, vol. 20, no. 4, Apr. 1920, pp. 97-98, 3 figs. Discussion of boiler and superheater developments as factors in progress of locomotive design in New South Wales.

Auxiliaries, Air Consumption of. Air Consumption of Locomotive Auxiliaries. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 395-398, 3 figs. Cost of wasted air shown and condemning limits proposed to raise standard of maintenance. Abstract of committee report and discussion, presented at annual convention of Air Brake Assn.

Axle Loads. A New Method for Determination of Axle Loads for Locomotives on More than Two Supports (Neues Verfahern zur Bestimmung der Achsbelastungen für Lokomotiven auf mehr als zwei Stützen), J. Jrotschek. Annalen für Gewerbe u. Bauwesen, vol. 86, nos. 4 and 5, Feb. 15 and Mar. 1, 1920, pp. 25-31 and 33-40, 22 figs. Describes method and gives extended calculations for a rigid axle on three, four and any given number of elastic supports.

Bagasse-Burning. Burning Bagasse, Clark Y. McGown. Combustion, vol. 3, no. 2, August 1920, pp. 22-24, 1 fig. Author shows that principles involved and results secured in burning bagasse are very similar to coal burning.

Baldwin Works, Eddystone. Locomotive Construction in the Baldwin Works at Eddystone, Arthur S. Goble. Boiler Maker, vol. 20, no. 6, June 1920, pp. 151-155, 7 figs. Details of work in a plant located on Delaware River, employing 21,500 men and covering 19.3 acres of ground, where are located main offices, drafting rooms and principal machine shops.

Boilers. See LOCOMOTIVE BOILERS.

Boosters for. The Locomotive Booster, J. Snowden Bell. Ry. Rev., vol. 67, no. 11, Sept. 11, 1920, pp. 387-388, 1 fig. Appliance for temporarily increasing tractive power of locomotive by means of a pair of auxiliary steam cylinders actuating trailing truck axle. Translated from Revue générale des Chemins de Fer.

Brake Beams, Splicing. Splicing Locomotive Brake Beams, Victor M. Summa. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, p. 653, 1 fig. In considering size of splice plates, writer states it is demonstrated that material of plates in contact with half of bolt shanks will be crushed if it cannot withstand 10,286-lb. load; hence, he determines each plate must be 5/16 inch thick.

British. A British Ten-Wheel-Coupled Locomotive, W. Parker. Ry. & Locomotive Eng., vol. 33, no. 5, May 1920, p. 131, 1 fig. Description of a 4-cylinder 0-10-0 locomotive for banking trains up an incline with gradient of 1 in 37.7 built at Derby Works for the Midland Railway of England.

British Locomotive Practice: 1914-1919, J. F. Gairns. Bul. Int. Ry. Assn., vol. 2, no. 1-2-3, Jan.-Feb.-March 1920, pp. 3-16, 6 figs. In regard to cylinder arrangement, reference is made to experiments with uniflow cylinders, which were followed by construction of three-cylinder 4-4-2 express locomotive on this principle. Construction of two 4-6-0 four-cylinder locomotives is also reported.

Great Northern Three-Cylinder Engine No. 1000. Engr., vol. 129, no. 3358, May 7, 1920, pp. 466-472, 12 figs. Dimensions: Cylinders, 18½ x 26 in.; total heating surface, 2308 sq. ft.; tractive effort at 85 per cent boiler pres-

sure, 30,031 lb.; total adhesive weight, 134,400 lb. Record of trial run is included.

L. and S. W. Ry. New Goods Locomotive. Engr., vol. 129, no. 3357, April 30, 1920, p. 458, 2 figs. Dimensions: Tractive effort at 85 per cent boiler pressure, 28,200 lb.; coupled wheels, diameter on tread 5 ft. 7 in.; class, 4-6-0; valve gear type, Walschaerts'.

New 4-6-0 Four-Cylinder Express Passenger Engines, Great Central Railway. Ry. Gaz., vol. 33, no. 11, Sept. 10, 1920, pp. 335-336, 2 figs. Dimensions: Cylinders, 16 in. diam. by 26 in. stroke; total heating surface, 2383 sq. ft.; surface of superheater elements, 343 sq. ft.; weight in working order, 79 tons, 3 cwt.

New Standard Boilers and Cylinders for South Eastern & Chatham Railway Locomotives. Ry. Engr., vol. 41, no. 487, Aug. 1920, pp. 342-346, 4 figs. Particulars of boiler are: Diameter outside from end, 4 ft. 7⅞ in.; diameter outside back end, 4 ft. 9⅛ in.; length between tube plates, 12 ft. 10 13/16 in.; firebox length outside casing, 8 ft.; working pressure, 200 lb. per sq. in.; heating surface, total, 1525.6 sq. ft.; superheater, 21 elements, 203 sq. ft.

New 0-10-0 Type Locomotive, Midland Railway. Ry. Engr., vol. 41, no. 484, May 1920, pp. 205-208, 7 figs, 1 on supp. plate. Locomotive constructed at company's works at Derby for heavy banking service on the Lickey incline which has gradient of 1 in 37.7.

2-8-0 Type Superheater Locomotive for the Ministry of Munitions. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 176-177, 7 figs. partly on supp. plate. Dimensions: cylinders, 21-in. diameter by 25 3/16-in. stroke; driving wheels, diameter, 4 ft. 6¼ in.; leading wheels, diameter, 3 ft. 1½ in.; total heating surface, 1715 sq. ft.; superheater surface, 308 sq. ft.; working pressure 135 lb. per sq. in.; length of engine, 38 ft. 9⅝ in.; weight of engine in working order, 71.4 tons.

See also English, Superheater.

Carbocoal for. Use of Carbocoal on Locomotives, George E. Scherick, Jr. Ry. Mech. Engr., vol. 94, no. 7, July 1920, pp. 452-453. Tests showed that carbocoal has many advantages, one of the chief of them being that it is a smokeless fuel. Paper read before Railway Fuel Association.

Coaling Stations for. Large Coaling Station Embodies a New Feature. Ry. Age, vol. 67, no. 26, Dec. 26, 1919, pp. 1225-1226, 2 figs. Designed to permit preparation of coal for stoker-equipped engines.

New Coaling Station Speeds up Engine Service. Ry. Age, vol. 68, no. 14, April 2, 1920, pp. 1085-1087, 3 figs. Station of Pittsburgh and Lake Erie with capacity of 750 tons. Locomotives are given coal, sand, ashes and water service during stop of 20 min. with train leaving on estimated spacing of 10 min.

Costs for Valuation Purposes. The Cost of Locomotives for Valuation Purposes. Ry. Age, vol. 69, no. 10, Sept. 3, 1920, pp. 387-390, 4 figs. Review of important studies by Presidents' Conference Committee on Federal Valuation.

C.P.R. Mikado Type. Details of the C. P. R. Mikado Type Locomotive, J. H. Rodgers. Can. Machy., vol. 23, no. 7, Feb. 12, 1920, pp. 173-177, 7 figs. Locomotive has tractive effort of 56,000 lb. Boiler is built on extension wagon-bottom type.

Cylinder Design. Modern Locomotive Design and Construction—LX. Ry. Engr., vol. 41, no. 484, May 1920, pp. 193-199, 7 figs. Description of cylinder design on certain types of engines on the L. & N. W. and N. E. Railways (England).

Cylinder Valves. New Application of Piston Valves to Slide Valve Cylinders, J. Snowden Bell. Ry. & Locomotive Eng., vol. 33, no. 5, May 1920, pp. 142-143, 3 figs. Description and illustrations of what is said to be a new and entirely practical method of converting inside steam-pipe slide-valve locomotive cylinders into outside steam-pipe piston-valve cylinders, devised and patented by Patrick Sheedy, superintendent of motive power of Southern Pacific System at Los Angeles, Cal.

Cylinders. The Casting and Machining of Locomotive Cylinders. Ry. Engr., vol. 41, no. 483, April 1920, pp. 175-183, 12 figs. Methods employed in production of cylinder castings with piston-valve steam chests for three-cylinder express freight locomotive of Great Northern Ry.

Cylinders, Welding. Repairing Locomotive Cylinders by Means of Oxy-Acetylene Welding (Ausbesserung von Lokomotivzylindern mittels der Acetylen - Sauerstoffschweissung). Autogene Metallbearbeitung, vol. 13, no. 4, Feb. 15, 1920, pp. 40-44, 12 figs., and Acetylen, vol. 23, no. 2, Feb. 1920, pp. 11-15, 12 figs. Describes various examples of repair work carried out by the firm of Samesreuther & Co., Butzbach.

Decapod. Pennsylvania Decapod Develops 3,500 Horsepower. Ry. Age, vol. 68, no. 14, April 2, 1920, pp. 1097-1103, 16 figs.

Pennsylvania Decapod Shows High Economy. Ry. Mech. Engr., vol. 94, no. 4, April 1920, pp. 193-199, 16 figs. Report of tests comparing IIs, hand and stoker fired, with performance of LIs Mikado.

Design. A New Departure in Locomotive Design, G. F. Berg. Ry. Rev., vol. 65, no. 23, Dec. 6, 1919, pp. 844-845, 1 fig. Consideration of weight and power ratios in heavy fast passenger locomotives and reference to proposed new design evolved from these considerations.

Locomotive Designing. Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 358-361, 3 figs. Features involved in locomotives using coal for fuel.

Modern Locomotive Engine Design and Construction. Ry. Engr., vol. 41, no. 486, July 1920, pp. 282-287, 5 figs. Describes piston rings, piston rods and piston tail rods, with various notes on safe working and permissible stresses.

Development. Scientific Development of the Steam Locomotive, John E. Muhlfeld. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 864-869. After outlining factors involved in determination of tractive power of locomotive writer discusses such items as boiler feedwater, types of fuel, combustion, heat description, steam pressures, superheating, and steam generation and utilization, and also methods of saving fuel and labor.

Diesel-Electric. Diesel-Electric Locomotives on Railways (Diesel-elektriske Motorvogner for Jernbanedrift), E. Hubendick. Teknisk Ukeblad, vol. 67, nos. 28 and 29, July 9 and 16, 1920, pp. 374-377 and 385-388, 13 figs. New type of railway motor car introduced on secondary lines in Sweden. Car weighs 29.3 tons and motive power is supplied by 75-hp. four-cycle Diesel oil engine having six cylinders and running at speed of 550 r.p.m.

Dust-Protecting Device. Dust-Protection Devices for Freight Locomotives (Staubverkleidung für Güterzugslokomotiven), Otto Hamader. Fördertechnik u. Frachtverkehr, vol. 13, no. 1, Jan. 9, 1920, pp. 7-8, 7 figs. In passing through cities locomotives often catch dust from the streets which causes damage to their mechanism and bearings; hence use of a dust protector is advised, of which several types are described.

Efficiency, Increasing. How to Increase the Efficiency and Operating Capacity of Steam Locomotives, B. B. Milner. Official Proc. New York Railroad Club, vol. 30, no. 6, April 16, 1920, pp. 6069-6089 and (discussion) pp. 6089-6095, 4 figs. Suggestions in regard to installing feedwater heater and trailer booster and lightening reciprocating and revolving weights by use of alloy steel.

Increasing Locomotive Operating Efficiency, R. S. Mounce. Ry. Age, vol. 68, no. 16, Apr. 16, 1920, pp. 1191-1196, 5 figs. Notes on adapting design to service conditions, modernizing, reassigning and accurate train loading.

Efficient Operation. Steam Generation in Locomotive Boilers (Ueber die Dampferzeugung im Lokomotivkessel), H. Meineke. Zeitschrift des Vereines deutscher Ingenieure, vol. 6, no. 47, Nov. 22, 1919, pp. 1169-1174, 4 figs. Discussion of Strahl's stack formula and its derivation. From Strahl's temperature curve of hot-gases conclusions are drawn concerning efficiency, heat utilization in superheat-steam boilers and value of fireboxes for evaporation. Good results are said to be obtained with very long as well as with very short boiler tubes.

Electric. See ELECTRIC LOCOMOTIVES.

Enginehouses. See ENGINEHOUSES.

English. See British.

English, Cylinder Design of. Modern Locomotive Design and Construction. Ry. Engr., vol. 41, no. 482, March 1920, pp. 93-98, 11 figs. Cylinder design on certain types of engines on London & Northwestern, Northeastern and Great Central railways of England.

English Superheater. New Locomotives for the Great Central Railway. Ry. Gaz., vol. 32, no. 15, April 9, 1920, pp. 556-557, 3 figs. Express locomotives of 4-4-0 type. Particulars are: Cylinders, 28-in. diameter by 26-in. stroke; working pressure, 180 lb. per square inch; heating surface, total, 1752 sq. ft.; superheater, inside, 209 sq. ft.

Exhaust of. The Exhaust of Locomotives, F. Legein. Bul. of International Ry. Assn., vol. 2, no. 5, June 1920, pp. 319-359, 22 figs. Discusses proper proportions and arrangement of blast-pipe and funnel, case of fluids of different densities, use of successive nozzles, complete arrangement, and relative arrangements of blast-pipe and chimney, including form of jet.

Express, German. New Design of Express Locomotive with Two Separate Driving Mechanisms for Especially High Power Output (Neue Bauart von Schnellzuglokometiven mit zwei getrennten Triebwerken für besonders grosse Leistung), R. Sanzin. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 33, Aug. 16, 1919, pp. 765-771, 8 figs. Main driving mechanism has two or more coupled axles and wheels of comparatively large diameter and is designed for continuous drive at high speed, while auxiliary mechanism, having also two or more coupled axles, only operates in starting or on steep grades.

Feedwater Heating. Feed-Water Heating in Peru. Ry. Engr., vol. 41, no. 484, May 1920, pp. 213-214, 3 figs. Describes what is said to be very cheap and satisfactory equipment for feedwater heating which has been adopted on locomotives of Southern Railways of Peru, with use of which fuel saving is estimated at 10 per cent while there has been reduction in boiler repairs.

Locomotive Feedwater Heating in Europe, Robert E. Thayer. Ry. Mech. Engr., vol. 94, no. 9, Sept. 1920, pp. 569-574, 8 figs. There are over 10,000 feedwater heaters in use on railways of Europe. These are distributed among Weir system, Caille-Potonie system and Knorr system, the latter having by far the greater distribution. Weir system is confined almost entirely to Great Britain, Caille-Potonie to France, and Knorr to Germany, Holland and Switzerland.

Locomotive Feedwater Heating, Thomas C. McBride. Mech. Eng., vol. 42, no. 5, May 1920, pp. 283-286 and 316, 5 figs. Pump and open type heater manufactured by Worthington Pump and Machinery Corp. are described and results of tests of their operation are presented.

Feedwater Treatment. Treatment of Water for Locomotives, William M. Barr. Ry. Rev., vol. 65, no. 26, Dec. 27, 1919, pp. 953-957. Notes on utility of boiler compounds, wayside treatment, boiler washing, etc., and conditions under which each of these is most useful.

Firing. See Stoker vs. Hand Firing.

4-8-0 Superheater. New 4-8-0 Type Compound-Superheater Locomotives for the Central Argentine Railway. Ry. Gaz., vol. 32, no. 19, May 7, 1920, pp. 694-695, 4 figs. Description of heavy oil-fired 5-ft. 6-in. gage engines, thirty of which have recently been completed by North British Locomotive Co., Ltd., Glasgow.

4-8-2, South African Railways. New 4-8-2 and 4-6-2 Type Locomotives, South African Railways. Ry. Engr., vol. 41, no. 480, Jan. 1920, pp. 38-39, 2 figs. Cylinders are 24 in. by 26 in. and 22 in. by 26 in. and weights are 96 and 82 tons, respectively.

4-4-0. See English Superheater.

4-6-0 Freight. New 4-6-0 Type Goods Locomotive, London & South Western Railway. Ry. Gaz., vol. 32, no. 19, May 7, 1920, pp. 699-700, 2 figs. Description of modern locomotive for freight service built on lines of London & South Western 4-6-0 express passenger locomotives, with which it has interchangeable parts.

See also British; Tank.

4-6-2. See 4-8-2, South African Railways.

Freight. New Mountain Type Locomotives for Fast Freight. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 608-611, 7 figs. Dimensions: Tractive effort, 53,900 tons; weight of engine and tender in working order, 511,000 tons; wheel base, total, 40 ft.; total heating surface, 4121 sq. ft.; superheater heating surface, 1009 sq. ft.; working pressure, 200 lb. per sq. in.

French. The Evolution of the High-Speed Locomotive in France, Between 1878 and 1914, and the Influence of Alsatian Practice, A. Herdner. Bul. Int. Ry. Assn., vol. 2, no. 1-2-3, Jan.-Feb.-March 1920, pp. 17-44, 13 figs. Attention is especially directed to development of Mallet compound type, first constructed in 1878 and introduced into many other countries since that time. Comparative economies of various types of locomotives equipped with turbo heaters are discussed.

Front-End Air Leaks. How Front-End Air Leaks Can Be Prevented. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 515-516, 5 figs. Account of tests made by Fuel Conservation Section of Railroad Administration to determine exact effect of reducing nozzles and disarranging front end to overcome effects of front-end air leaks.

Fuel Economy. Fuel Economy and Locomotive Operation, Robert Collett. Official Proc. St. Louis Ry. Club, vol. 24, no. 7, Nov. 14, 1919, pp. 124-141 and (discussion) pp. 142-161. Charts illustrating relation average gross tons per locomotive mile bears to unit fuel consumption.

Locomotive Fuel Economy and Smoke Prevention. Canadian Ry. & Marine World, no. 270, Aug. 1920, pp. 415-423, 11 figs. Report presented by Committee on Fuel Economy and

Smoke Prevention at meeting of Mechanical Section, Am. Railroad Assn.

Fuel for. See COAL, Iowa and Illinois.

Fuel Tests. Locomotive Fuel Tests on the Great Central Railway. Ry. Gaz., vol. 33, no. 2, July 9, 1920, pp. 60-62, 1 fig. Results obtained with locomotives equipped for burning ordinary coal, colloidal fuel, and pulverized coal.

Gasoline. The Gasoline Locomotive of the Highways, Harry Wilkin Perry. Sci. Am., vol. 121, no. 21, Nov. 22, 1919, pp. 514-515, 522 and 524, 5 figs. Models for use as road tractors with semi-trailers.

German. German Standard Heavy Freight Locomotive. Ry. Rev., vol. 67, no. 6, Aug. 7, 1920, pp. 197-199, 2 figs. Dimensions: Cylinders, diameter and stroke, 22.4 in. and 22.98 in.; wheels, coupled, diameter, 4 ft. 7 in.; total length of engine, 38 ft. 4 in.; mean diameter of boiler, 5 ft. 10.9 in.; working pressure, 199.1 lb. per sq. in.; heating surface, total, 2077.6 sq. ft.; weight in working order, 92.865 tons.

Great Northern Railway, England. New Express Goods Locomotive, Great Northern Railway. Ry. Gaz., vol. 33, no. 11, March 12, 1920, pp. 408-411, 6 figs. Design incorporates three single-expansion cylinders, boiler of high capacity and maximum loading on coupled wheels. Weight of engine and tender in working order, 114 tons, 16 cwt.

Headlights, Electric. Maintaining and Operating Electric Headlights. Ry. Elec. Engr., vol. 11, no. 1, Jan. 1920, pp. 12-17, 6 figs. Abstract of handbook prepared by Chicago, Rock Island & Pacific on operation and maintenance of electric headlight equipment. Equipment used most extensively by road is of Pyle National type.

Standardization of Locomotive Headlight Equipment. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 329-333, 3 figs. Recommendations include generator base plate, steam pressure range, ball bearings, brush sizes, etc. Committee report of Assn. Ry. Elec. Engrs.

Hollow Steel Axles. Hollow Steel Axles for Locomotives, Julian Pollak. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 362-364, 5 figs. It is said that pipes and improper heat treatment are principal causes of failure. Experience of one railroad is quoted.

Large-Cylinder. Diameter and Travel Ratios for Locomotive Valves and Cylinders, O. W. Young. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 924-926. Points out difficulty of securing adequate steam and exhaust-port area on modern locomotives having large cylinders; proposed solution to difficulty lies in so arranging valve gears as to permit of greater valve travel. Paper presented before Can. Ry. Club.

Luttermöller. Locomotives with Luttermöller Radial Axles (Bogenläufige Lokomotive mit Lüttermöllers Radialachsen), Heinrich Papst. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 31, July 31, 1920, pp. 599-602, 9 figs. Describes new gear-driven radial axle and demonstrates its use on light narrow-gage locomotives. Axle is equally suitable for inside and outside frames.

Maize as Fuel. Maize as Fuel for Steam Boilers. Ry. Gaz., vol. 31, no. 17, Oct. 24, 1919, pp. 525. Use on locomotive engines in Argentine, with notes on calorific value and costs.

Mallet. Simple "Mallet" Locomotive, Pennsylvania Railroad. Ry. Jl., vol. 25, no. 8, Aug. 1919, pp. 16-21, 5 figs. Principal data are: Tractive effort 135,000 lb.; weight in working order 575,000 lb.; extreme height 16 ft.; Belpaire boiler; working pressure (designed for 225 lb.) 205 lb.

Manufacture. Locomotive Building and Repair Operations at Swindon Works, Great Western Railway. Ry. Gaz., vol. 33, no. 12 and 13, Sept. 17 and 24, 1920, pp. 360-364, 378 and 401-404, 18 figs. Illustrated description of treatment of locomotive parts in machine, etc., shops at works of Great Western Ry., England.

Mikado. New Canadian Pacific Locomotives, W. A. Newman. Ry. Mech. Engr., vol. 93, no. 11, Nov. 1919, pp. 631-636, 11 figs. Mikado type for freight service; heavy frame construction and interchangeable side rods.

See also C.P.R., Mikado Type.

Mikado Freight. Mikado Type Locomotive for Freight Service, W. A. Newman. Ry. Age, vol. 68, no. 2, Jan. 9, 1920, pp. 173-177, 8 figs. Total weight, 320,500 lbs.; tractive effort, 56,000 lb. Cylinders are 25 in. by 32 in.; driving wheels, 63 in. outside diameter.

Mine. See MINE LOCOMOTIVES.

Motive-Power Economics. The Locomotive as an Investment, George M. Basford. Ry. Age, vol. 68, no. 24b, June 12, 1920, pp. 1743-1747 and (discussion) pp. 1747-1748; also Ry. Rev., vol. 66, no. 24, June 12, 1920, pp. 978-983. Analysis of motive-power economics with suggestions for improvement. Paper read before Sect. III—Mech. of Am. R. R. Assn.

Narrow-Gage. See RAILWAYS, Narrow-Gage.

Number Needed Before 1923. Adequate Motive Power for Railroads a Necessity. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 33-36. Figures indicating motive power required in next three years and estimated cost.

Oil-Burning. Oil Burning on the A. T. & S. F. System, Walter Bonstengel. Railroad Herald, vol. 24, no. 7, June 1920, pp. 33-39, 4 figs. Tabulated general summary is shown, and general statement of average results for eastbound runs, representing harder working conditions of locomotive, is given. Abstract of paper read before Internat. Ry. Fuel Assn.

Oil Fuel on the Paris, Lyons and Mediterranean Railway. Engr., vol. 129, no. 3359, May 14, 1920, pp. 494-496, 6 figs. Describes three types of burners which are being tried by railway, and two methods in use of employing liquid fuel in boilers of locomotives.

Oil Firing. Heavy Oil as Locomotive Fuel (Le chauffage aux huiles lourdes appliqué aux locomotives), L. Pierre-Guédon. Génie Civil, vol. 76, no. 14, April 3, 1920, pp. 329-333, 10 figs. Translation in Bul. Int. Ry. Assn., vol. 2, no. 8, Aug. 1920, pp. 517-527, 10 figs. Burner for oil residue used in locomotives of Paris, Lyons and Mediterranean Railway.

The Scarab System of Oil Fuel Burning on Locomotives. Eng., vol. 110, no. 2853, Sept. 3, 1920, pp. 324, 3 figs. System as applied in locomotive of London and Northwestern Railway. System was introduced by Scarab Oil Burning Co., Ltd., Haymarket, England.

Oil vs. Coal-Burning. Santa Fe Locomotive Oil Burning Practice and Fuel Performance, Walter Bohnstengel. Ry. Mech. Engr., vol. 94, no. 7, July 1920, pp. 449-450. Santa Fe System has approximately 3160 locomotives, of which two-thirds use coal and one-third use oil as fuel. Tests show evaporate efficiency of oil is about 25 per cent more than coal for hand-fired and 40 per cent more than coal for stoker-fired locomotives. Also showed that installation and maintenance of brick arch cannot be justified in oil-burning locomotives. From paper read before Railway Fuel Association.

Operation. Locomotive Operation, T. J. Hartnett. Official Proceedings Central Ry. Club, vol. 27, no. 5, Nov. 1919, pp. 692-698 and (discussion), pp. 699-720. Writer discusses fuel economy, lubrication, superheaters, testing for valve and cylinder blows, power reverse gear, injector failures, care of electric head-

light and cost of maintenance and inspection of power.

0-10-0. A New 0-10-0 Type Locomotive. Ry. Gaz., vol. 32, no. 14, April 2, 1920, pp. 522-523, 3 figs. Particulars: 4 cylinders of 16¾-in. diameter and 28-inch stroke; wheels, diameter, 4 ft. 7½ in.; wheelbase, 20 ft. 11 in.; heating surface, total, 1718.25 sq. ft.; superheater surface, 445 sq. ft.; grate area 31.5 sq. ft.

See also British; Superheater.

Pennsylvania Decapod. See Decapod.

Piston Rings. See PISTON RINGS, Locomotive.

Piston-Rod Packing. Cast Iron Piston Rod Packing. Ry. Mech. Engr., vol. 93, no. 10, Oct. 1919, pp. 577-578, 6 figs. Practice of two English railroads. One uses mixture of 40 per cent. selected scrap, 30 per cent. Kettering silicious material and 30 per cent. old ingot molds and the other makes packing from ordinary commercial quality of cast iron with approximately 33 per cent Barrow hematite added.

Pistons. See PISTONS, Locomotive.

Pulverized-Coal-Burning. Locomotive Fitted for Burning Pulverized Fuel. Ry. Gaz., vol. 32, no. 2, Jan. 9, 1920, pp. 55-59, 7 figs.; also Ry. Engr., vol. 41, no. 481, Feb. 1920, pp. 49-53, 6 figs. Scheme invented and patented by J. G. Robinson, chief mechanical engineer of Gt. Cen. Ry., England.

Radial-Axle. See Luttermöller.

Radial Tank. A New Radial Tank Engine. Ry. Gaz., vol. 32, no. 4, Jan. 23, 1920, p. 123, 1 fig. Locomotive is of 0-6-2 type. Dimensions are: Cylinders, 18¼-in. diameter by 26-in. stroke; boiler, working pressure, 180 lb. per sq. in.; total heating surface, 1254 sq. ft.; weight, 66 tons, 19 cwt.

Rail Pressure Due to Brake Action. Effect of Brake Action on Spring and Rail Pressures of a Locomotive (Einfluss der Bremswirkung auf die Feder- und Schienendrucke der Lokomotive), J. Jrotschek. Annalen für Gewerbe und Bauwesen, vol. 85, no. 2, July 15, 1919, pp. 9-12, 6 figs. Table is included giving spring loads and rail pressures during braking.

Rebuilding. A Useful Locomotive Rebuilt. Ry. Engr., vol. 41, no. 485, June 1920, pp. 259-262, 7 figs. Illustrated description of rebuilding of class "E" express locomotive on South-Eastern & Chatham Ry., special features being small increase in weight and greatly increased efficiency.

Rebuilt. Northern Pacific Converts Prairie Type to Mikado. Ry. Age, vol. 67, no. 20, Nov. 14, 1919, pp. 960-962, 4 figs. How motive power which was no longer suitable for heavy service was designed to increase train load and decrease unit consumption of fuel.

Rebuilt Passenger Locomotives. Ry. Gaz., vol. 31, no. 23, Dec. 5, 1919, pp. 745-746, 2 figs. Increasing boiler power of engines at shops of Lancashire and Yorkshire Railway.

Redesigning. Changing Prairie Type to Mikado. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 694-696, 4 figs. Redesigning of boiler to increase efficiency and provide ample steaming capacity for larger cylinders.

Repair Costs. Reducing Cost of Locomotive Repairs, S. W. Mullinix. Ry. Rev., vol. 66, no. 20, May 15, 1920, pp. 795-797. Rearranging and regrouping machines, dividing shops into separate departments and other means of reducing costs. Paper read before West. Ry. Club.

Repair Shops. Locomotive Workshops at Eveleigh, N. S. W. Commonwealth Engr., vol. 6, no. 3, Oct. 1, 1918, pp. 89-94, 4 figs. Equipment of riveting plant, repair shop and foundry.

Pennsylvania Lines Improved Locomotive Facilities. Ry. Age, vol. 67, no. 18, Oct. 31, 1919, pp. 863-869, 14 figs. Details of heavy repair locomotive shop recently put into operation and of roundhouse about to be completed.

See also RAILWAY REPAIR SHOPS, Locomotive.

Repairs. Graphic Production Control, E. T. Spidy. Can. Ry. & Mar. World, no. 264, Feb. 1920, pp. 55-58, 7 figs. Records used for computing current locomotive repair costs.

Scheduling and Routing Systems for Locomotive Repairs. Ry. Age (Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1716-1719, 4 figs. Practices of several railroads. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

See also ELECTRIC WELDING, ARC, Cast Iron; THERMIT WELDING, Locomotive Repairs.

Roundhouses. See ROUNDHOUSES.

Santa Fe. New Locomotives for the Santa Fe Railroad. Ry. Rev., vol. 65, no. 26, Dec. 27, 1919, pp. 947-949, 3 figs. Examples of three designs for fast and heavy passenger service and road freight work.

New Santa Fe Type Locomotive for the Alabama & Vicksburg Railroad. Ry. & Locomotive Eng., vol. 32, no. 10, Oct. 1919, p. 289, 1 fig. Principal dimensions are: Size of cylinders, 26 by 18 in.; diameters of drivers, 57 in.; steam pressure, 185 lb. per sq. in.; weight on drivers, 218,390 lb.; total weight of engine, 274,715 lb.

Santa Fe Type Locomotives for Light Track. Ry. Mech. Engr., vol. 93, no. 10, Oct. 1919, pp. 583-584, 1 fig. Principal characteristics of Santa Fe and Mikado types.

Shops. A Great Locomotive Building Concern. Ry. Gaz., vol. 32, no. 26, June 25, 1920, pp. 935-941, 12 figs. Evolution of North British Locomotive Co., Ltd., and account of firm's activities prior to, during and since the war.

Locomotive Building at Scotswood. Engineer, vol. 128, no. 3335, Nov. 28, 1919, pp. 536-537 and 540, 18 figs., partly on 2 supp. plates. Arrangement of shops engaged in shell manufacture to building of locomotives.

Shops, England. Locomotive Building and Repair Operations at Swindon Works, Great Western Railway. Ry. Gaz., vol. 33, no. 10, Sept. 3, 1920, pp. 302-307, 7 figs. Machining locomotive cylinders, drilling operations on frame plates, and boiler works.

Speed Indicators. Speed Indicators and Recorders for Application to Locomotives. Ry. Gaz., vol. 32, no. 22, May 28, 1920, pp. 794-795, 4 figs. Description of "Teloc" locomotive speed indicator and recorder, recently put on the market by Hasler Telegraph Works, London.

Steam Separators for. Purification of Steam for Locomotives (Reinigung des Dampfes für Lokomotiven und deren Wirtschaft), Ewald Mees. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 5, Mar. 1, 1920, pp. 68-71, 2 figs. Points out defects in devices such as the Kappe's baffle used on the Prussian and Hessian railroads, and describes centrifugal steam separator patented by author and constructed for locomotives and stationary boilers, consisting of a cylindrical vessel in which steam enters and is conducted through a spiral-shaped conduit until it reaches outlet in the center.

Steel for. Report on Specifications and Tests for Materials. Ry. Age, Daily Edition, vol. 68, no. 24, June 15, 1920, pp. 1795-1800, 4 figs. Practice recommended by Committee of Am. Railroad Assn., Mech. Section, in regard to method of manufacture and tests of steel for tires of locomotives and cars, boiler and fire

box of locomotives, journal bearings, axles, shafts and other forgings.

Stoker-Fired. Advantages of Stoker Fired Locomotives, D. F. Crawford. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 127-130, 4 figs. Graphs are given showing comparison of coal used per i.hp. hour with hand and stoker firing. It is concluded that if stoker is properly inspected, lubricated, maintained and operated it will add to earnings of railroads, comfort of employees and banish troubles due to engines not steaming.

Stokers. Economical Operation of Locomotive Stokers. Ry. Rev., vol. 65, no. 24, Dec. 13, 1919, pp. 869-871, 1 fig. Recommendations of U. S. RR. Administration.

Mechanical Stokers for Locomotives, W. A. Benson. Ry. Rev., vol. 67, no. 6, Aug. 7, 1920, pp. 199-203. Consideration of status of locomotive stokers with respect to work that it is doing, influence of that work on economics of railway operation, and also considerations that should be shown stoker in getting best results from its use.

Superheater. A Convenient Method of Recording Performance of Superheated Steam Locomotives for Traction Service, Especially for the Planning of Schedules (Ueber eine zweckmässige Darstellungsart von Leistungen der Heissdampflokomotiven zur Verwendung im Zugförderungsdienst, besonders auch bei Aufstellung von Fahrplänen, erläutert an praktischen Beispielen), H. Velte. Annalen für Gewerbe u. Bauwesen, vol. 87, nos. 1 and 2, July 1 and 15, 1920, pp. 2-7 and 9-14, 7 figs. Practical examples are cited.

Boilers for 2-8-0 Goods Engines, Great Central R. Ry. Engr., vol. 40, no. 479, Dec. 1919, pp. 258-262, 5 figs. Boilers are fitted with superheaters of 28 elements and made for working pressure of 180 lb. per sq. in.

Cylinders of 0-8-0 Type Superheater Locomotive; North-Eastern Railway. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 208-209, 11 figs. Details of cylinders, and records of trials of locomotive.

Efficiency of Clench Superheater (Alcune prove per valutare la efficienza ed il rendimento del surriscaldatore sistems Clench), Alessandro Mascini. Rivista tecnica delle Ferrovie italiane, vol. 18, no. 2, Aug. 15, 1920, pp. 48-55, 2 figs. Records of service of locomotives with Clench superheaters operated by Italian State Railways.

Horwich Superheater with Top and Bottom Headers. Ry. Gaz., vol. 31, no. 18, Oct. 31, 1919, pp. 556-557, 3 figs. Leading particulars are: cylinders, diameter, 21½ in.; wheels, diameter, 4 ft. 6 in.; boiler pressure, 170 lb. per sq. in.; weight of engine in working order without tender, 66½ tons. These engines are said to be capable of dealing with very heavy goods and mineral trains on all parts of Lancashire and Yorkshire main lines.

0-10-0 Type Superheater Locomotive for the Midland Railway. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 311 and 314, 15 figs. partly on 2 supp. plates. Data: Cylinders, four, 16¾-in. diameter by 28-in. stroke; valve motion, Walschaerts; wheels, diameter, 4 ft. 7½ in.; total heating surface, 1718.25 sq. ft.; superheater surface, 445 sq. ft.; working boiler pressure, 180 lb. per sq. in.; tractive force at 85 per cent boiler pressure, 43,312 lb.; weight of engine in working order, 72 tons 13 cwt.

Report of Committee on Superheater Locomotives. Ry. Age (Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1720-1721. Installation, operation, care, and maintenance of superheater equipment for locomotives. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

The Northeastern Superheater. Eng. & Indus. Management, vol. 2, no. 26, Dec. 25, 1919, p. 821, 1 fig. Consists of headers arranged in pairs between nests of boiler tubes.

Three-Cylinder 0-8-0 Type Superheater Locomotive; North-Eastern Railway. Engineering, vol. 109, no. 2819, Jan. 9, 1920, p. 50, 3 figs. partly on supp. plate. Specifications: Cylinders, diameter, 18½ in.; cylinders, stroke, 26-in.; boiler diameter, 5-ft. 6-in.; boiler length of barrel, 15-ft. 10½-in.; heating surface, total, 1573-sq. ft.; working pressure, 180-lb. per sq. in.; weight in working order, 71 tons 12 cwt.

See also English Superheater; 4-8-0 Superheater.

Switching. Eight-Coupled Switcher Locomotives for the Cambria Steel Company. Ry. & Locomotive Eng., vol. 33, no. 10, Oct. 1920, p. 302, 1 fig. Operate on maximum grades of 1½ per cent combined with curves of 12 deg. and are capable of traversing curves as sharp as 24 deg.; they exert a tractive force of 68,000 lb.

Heavy Ten-Wheel Locomotives for Switching Service. Ry. Age, vol. 68, no. 5, Jan. 30, 1920, pp. 359-363, 11 figs. Specifications: Cylinders, 27-in. diameter by 28-in. stroke; driving wheels, diameter, 51-in.; working pressure, 185 lb. per sq. in.; total weight, 295,000 lb.

Tank. Converted Tank Locomotive, North Eastern Railway. Ry. Gaz., vol. 32, no. 19, March 5, 1920, pp. 372-373 and p. 380, 4 figs. Conversion from 4-6-0 to 4-6-2 type.

New 0-6-2 Type Tank Locomotives for the Taff Vale Railway. Ry. Engr., vol. 41, no. 482, March 1920, pp. 107-110, 5 figs. Design embodies short rigid wheelbase which is kept within moderate limits by adoption of single radial axle below cab. Cylinders are located inside frame.

New Tank Locomotives, Belfast and County Down Railway. Ry. Gaz., vol. 33, no. 13, Sept. 24, 1920, p. 408, 1 fig. Characteristics: Wheelbase, 4-6-4; boiler pressure, 170 lb. per sq. in.; cylinders, 26 in. stroke by 5 ft. 6 in. diameter; tractive force, 18,130 lb. at 75 per cent boiler pressure; total heating surface, 1621.7 sq. ft.; combined capacity of side and bunker tanks, 2000 gal. of water; accommodation is provided for 4 tons of coal.

See also Radial Tank.

Tender Connections. Safety Connections Between Engine and Tender. Ry. Age (Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1707-1711, 6 figs. It is urged that all new locomotives be built with central safety bar located immediately beneath drawbar, and where construction of locomotive and tender prevents this, that two safety bars be applied, one located on each side of drawbar and as near thereto as possible. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

Terminals. See TERMINALS, LOCOMOTIVE.

2-8-0. See British.

Valuation. The Valuation of Locomotives. Ry. & Locomotive Eng., vol. 33, no. 10, Oct. 1920, p. 292, 1 fig. Includes diagram showing relative price curve of locomotives from 1910 to 1919, inclusive.

Valve Gear. Actuating Mechanism of the Steam Locomotive. Ry. & Locomotive Eng., vol. 33, no. 9, Sept. 1920, pp. 260-263, 5 figs. Piston-type valve gear invented by O. W. Young.

The Development of Locomotive Valve Gear, James Dunlop. Engr., vol. 130, no. 3366, July 2, 1920, pp. 15-17, 11 figs. Describes various gears in chronological order, concluding with Hackworth's gear of 1849, which, it is claimed, represents the complete development of a modern reversing gear, the "cross-operation" of

the valves making it the highest expression of type first brought into use by Richard Roberts in 1833.

Valve Setting. Effect of Lame Engines on Fuel Consumption, J. W. Hardy. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 24-26. Tests made on Houston & Galveston divisions of Southern Pacific to determine increase in fuel consumption resulting from operating locomotive engines with valves out of adjustment. Paper read before Int. Ry. Fuel Assn.

Setting Locomotive Valves, L. D. Freeman. Ry. Mech. Engr., vol. 93, no. 11, Nov. 1919, pp. 669-674, 25 figs. Instructions for setting Walschaerts, Young and Stephenson gears.

Welding Cylinders and Fireboxes. See OXY-ACETYLENE WELDING, Locomotives.

Wheel-Balancing Machine. Locomotive Wheel Balancing Machine. Engr., vol. 129, no. 3354, Apr. 2, 1920, pp. 354-355, 7 figs. Axle is placed on bearings which are each supported on four springs so arranged that bearings may "float" and "dither" with axle, should wheels when spun be out of strict balance.

Works. Beardmore's Locomotive Works. Engr., vol. 130, no. 3372, Aug. 13, 1920, pp. 149-150, 11 figs. partly on 2 supp. plates. Reconstruction for locomotive manufacture of works building large gun mounting during war.

LOCOMOTIVES, ELECTRIC

See ELECTRIC LOCOMOTIVES.

LOGGING

Electrical. See ELECTRIC LOCOMOTIVES, Logging; ELECTRIC RAILWAYS, Logging Industry.

LOGGING INDUSTRY

See ELECTRIC RAILWAYS, Logging Industry, Use in.

LUBRICANTS

Cutting-Tool. Cutting Lubricants for Machine Tools. Machy. (Lond.), vol. 15, no. 382, Jan. 22, 1920, pp. 530-532. Table indicating cutting lubricants considered as most suitable for different machine operations and metals.

Cutting-Tool, Sterilizing. Sterilizing Cutting Oils by Pasteurization and Centrifugal Separation. Machy. (N. Y.), vol. 26, no. 4, Dec. 19, 1919, pp. 378-382, 4 figs. Also Machy. (Lond.), vol. 15, no. 383, Jan. 25, 1920, pp. 566-568, 4 figs. Experimental plant installed at Ford Motor Co.'s plant.

Engine, Dilution by Fuel. Dilution of Engine Lubricants by Fuel, Gustave A. Kramer. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 123-128, 13 figs. Experiments to determine effect of dilution by fuels on viscosities of lubricants, fuels being diluted either by average grade of fuel gasoline or by commercial kerosene. Use of oil renovator as part of engine itself is suggested.

The Proper Balancing of Fuel, Lubricant and Motor, William F. Parish. Mech. Eng., vol. 42, no. 3, Mar. 1920, pp. 164-168, 8 figs. Experiments conducted to determine cause of dilution of motor lubricating oil demonstrated, it is claimed, that it is due mainly to leakage past piston rings during compression stroke. It is recommended that selection of motor oil for given motor be based upn scientific grounds and that engines be designed to permit entire consumption of fuel on top of pistons.

Greases. See LUBRICATING GREASES.

Standards for. Government Standards for Oils and Greases. Power, vol. 52, no. 3, July 20, 1920, pp. 99-103, 1 fig. Abstract of report of U. S. Government's committee on Standardization of Lubricants.

Tests. Lubrication as Applied to Power-Plant Operation, Robert June. Elec. Rev. (Chic.), vol. 77, no. 3, July 17, 1920, pp. 89-91. Paper gives physical tests of lubricants for determining qualities desirable for power-plant machinery, and notes on bearing lubrication and on the selection of lubricants for motors and refrigerating machinery.

Viscosity. See VISCOSIMETERS.

LUBRICATING GREASES

Viscosity. The Consistency of Greases, F. S. Clulow and C. W. Taylor. Jl. Soc. Chem. Industry, vol. 39, no. 16, Aug. 31, 1920, pp. 291T-295T, 12 figs. Apparatus for measuring viscosity of lubricating greases.

LUBRICATING OILS

Automobile-Engine. See AUTOMOBILE ENGINES, Lubricating Oils for.

Castor Oil, Manufacture of. Operation of the Gainesville Castor Oil Plant, J. H. Shrader and A. C. Goetz. Chem. & Metallurgical Eng., vol. 22, no. 18, May 5, 1920, pp. 833-838, 5 figs. Details of installation and solvent extraction process of obtaining high recovery of oil from castor beans.

Castor vs. Mineral Oil. A Comparison of Qualities of Castor and Mineral Oils, Fred C. Ziesenheim. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 612-613, 1 fig. Results of tests. Superiority of castor oil over mineral oils for particular conditions of service is due primarily to its greater capillarity which results from presence of free fatty acids.

Examination of. Methods of Examination of Lubricating Oils, G. F. Robertshaw. Eng. & Indus. Management, vol. 3, no. 22, May 27, 1920, pp. 675-679. Present lack of uniformity in methods in use for examination of lubricants and efforts being made to overcome difficulties arising out of this absence of a recognized standard are referred to. It is pointed out that in examination of lubricating oils, correct appreciation of relation between physical and chemical tests is essential. Some well-known tests for lubricating oils are described. Paper read before Instn. Petroleum Technologists.

Specifications. Development of Oil Specifications, William F. Parish. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 313-315. Points to be considered in drawing up specifications, with reference to specifications for lubricating oils used by War Department.

Writing Specifications for Lubricating Oils and Greases, A. A. Potter and A. J. Mack. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 281-282. General properties of oils which have bearing on specifications. Typical specifications for turbine, dynamo and other oils.

Viscosity. See VISCOSIMETERS.

Voltol. Friction in Journal Bearings When Lubricated by Mineral Oil to which Voltol Has Been Added and under Variation of Speed and Temperature (Die Reibung in Gleitlagern bei Zusatz von Voltol-Oel zu Mineralöl und bei Veränderung der Umlaufzahl und der Temperatur), C. Biel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 25 and 26, June 19 and 26, 1920, pp. 449-452 and 483-485, 9 figs. It is demonstrated by a number of tests carried out in 1915 at the Technical High School, Carlsruhe, that a mixture of mineral oil and "voltol" acts differently from pure mineral oil of the same viscosity and reasons therefor are given. Gives some new expressions for dependence of friction on speed, temperature and viscosity, which are said to agree with those of former researches.

LUBRICATION

Bearings. Oiling System and Bearing Designs, A. E. Windram. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 745-746, 3 figs. General outline of system and bearings that retain oil by means of sealing rings and end plates. Paper read before Inst. Mar. Engrs., London.

Capillarity and. The Nature of Capillarity and Its Relations to the Lubricating Quality of Oils and to the Lubrication of Metals (Das Wesen der Kapillarität, ihre Beziehungen zur Schmiergiebigkeit der Schmieröle und zur Schmierfähigkeit der Metalle). Petroleum, vol. 16, nos. 8 and 9, July 10 and 20, 1920, pp. 249-254 and 285-291, 25 figs. Claims that the lubricating power of oil can be directly calculated and that it is influenced by the lubricating metal itself.

Distribution of Oil Pressure. The Science and Art of Lubrication, H. T. Newbigin. Machy. (Lond.), vol. 15, no. 381, Jan. 15, 1920, pp. 502-505, 5 figs. Theoretical study of distribution of oil pressure under a square block and on pivoted blocks. Paper read before Liverpool Engr. Soc.

Fatty Oils and Acids. The Theory and Practice of Lubrication; The "Germ" Process, Henry M. Wells and James E. Southcombe. Jl. Soc. Chem. Industry, vol. 39, no. 5, March 15, 1920, pp. 51T-55T and (discussion) pp. 55T-60T, 5 figs. Writers conclude from physical and physico-chemical study of lubrication, as well as from their experience that fatty compounded oils are unnecessary for many purposes of lubrication and that fatty acids can entirely and completely displace oils for such purposes.

Germ Process. The Germ Process of Lubrication, Henry M. Wells and James Ed Southcombe. Ry. Rev., vol. 67, no. 2, July 10, 1920, pp. 45-48. It is demonstrated by laboratory processes that increased value of compounded oils is due to presence in them of fatty acids introduced as impurities with vegetable or animal oils added to mineral oil as per formula or specification. By addition of fatty acids, it is said, authors have been able to duplicate and even improve on results yielded by compounded oils and with a degree of economy measured by cost of vegetable and animal oils formerly employed. From paper read at Nat. Petroleum Assn.

High-Speed Engines. Meeting Lubrication Requirements in High Speed Engines, Alanson P. Brush. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1302-1304, 2 figs. System of high speed engine lubrication adopted by some of leading automobile and engine manufacturers.

Shop Problems. The Shop Lubricating Problem, Raymond Francis Yates. Sci. Am., vol. 121, no. 20, Nov. 15, 1919, pp. 484, 494 and 498, 1 fig. Bearings are classified into (1) high-speed, high-pressure bearings, (2) medium-speed, medium-pressure bearings, (3) high-speed, low-pressure bearings and (4) special bearings. Importance of using special oils for lubricating each one of these classes is emphasized.

Steam Turbines. See STEAM TURBINES, Lubrication.

Theory of. Lubrication and Lubricants, G. B. Upton. Elec. Ry. Jl., vol. 56, no. 5, July 31, 1920, pp. 219-223, 4 figs. Late theories of lubrication are discussed and effects of different conditions on the lubricant to be used are pointed out. From Sibley Jl. of Eng.

Viscosity Tests in. Power Plant Management—Lubrication, Robert June. Power House, vol. 12, no. 18, Nov. 5, 1919, pp. 493-495. With remarks on importance of viscosity tests as guide to lubrication.

LUMBER

Economical Use in Building. Standard Lengths, Sizes and Quality of Lumber as Related to Economic Designs. Eng. & Contracting, vol. 53, no. 25, June 23, 1920, p. 721. Suggestions for securing more efficient design and application of lumber in building, extracted from leaflet issued by Architectural & Building Code Service of Nat. Lumber Mfrs.' Assn.

LUMINESCENCE

Alkaline Metals. Emission at High Temperatures of Luminous Particles by Alkaline Metals (Sur l'emission aux températures hautes de particules positives lumineuses par les métaux alcalins), G. A. Hemselech. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 1, Jan. 5, 1920, pp. 44-47. Two hypotheses are advanced to explain phenomenon of emission.

M

MACHINE CONSTRUCTION

Substitute Materials. Recent Experiences and Experiments with Substitute Materials in the Construction and Operation of Machines (Mitteilungen über neuere Erfahrungen und Versuche mit Ersatzstoffen im Bau und Betrieb von Maschinen), G. v. Hanffstengel. Annalen für Gewerbe u. Bauwesen, vol. 86, no. 7, Apr. 1, 1920, pp. 49-57, 22 figs. Address read before Assn. German Machine Engineers in Feb. 1917, but withheld from publication during war.

Tolerances and Allowances. Standardization of the Limit System in Machine Construction, P. M. Heldt. Automotive Industries, vol. 42, no. 15, Apr. 8, 1920, pp. 858-861, 4 figs. Review of practices in European countries with special reference to German standards for tolerances and allowances for fits under basic shaft system which was adopted as standard by Hanover Section of German Soc. of Engrs. at its meeting of Jan. 15, 1919.

MACHINE DESIGN

Labor-Saving Machinery. Specialization in Design of Labour-Saving Machine, C. H. Smith. Eng. & Industrial Management, vol. 3, no. 9, Feb. 26, 1920, pp. 266-270. Suggestions in regard to designing and installing of labor-saving machines. Paper read before Birmingham Assn. of Mechanical Engrs.

Repairs, Provision for. A Plea for Better Harmony between Theory and Practice. Machy. (London), vol. 16, no. 409, July 29, 1920, pp. 527-531, 13 figs. It is pointed out that designers should never lose sight of certainty that repairs and replacements of worn parts will one day be needed even on best-designed machines. Examples are given illustrating how to provide for repairs in machine design.

Working Out Details. Designing a Special Machine. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 609-612, 6 figs. Value of schedules in working out preliminary details is illustrated by working out example of special duplex grinding machine.

MACHINE GUNS

Beardmore-Farquhar. The Beardmore-Farquhar Light Machine Gun. Engineer, vol. 128, no. 3333, Nov. 14, 1919, pp. 494-497, 10 figs. Weapon depends for its operation on pressure

of gases of explosion acting on piston contained in cylinder fitted to under side of fore part of barrel.

MACHINE SCREWS

Standards. See BOLTS, Standards for.

MACHINE SHOPS

College. The Loughborough Technical College. Eng., vol. 110, nos. 2850 and 2851, Aug. 13 and 20, 1920, pp. 199-202, 19 figs. partly on 2 supp. plates, and 232-236, 12 figs. Instructional factory organized throughout as far as possible as commercial firm.

English. The Works of Messrs. Clayton and Shuttleworth, Ltd., at Lincoln. Eng., vol. 109, nos. 2840 and 2841, June 4 and 11, 1920, pp. 741-747, 30 figs., and 778-801, 11 figs. Steam and electric road tractors, railway rolling stock, drop stampings and steel forgings are manufactured in works.

The Works of Messrs. Marshall, Sons and Co., Ltd., Gainsborough. Eng., vol. 109, nos. 2837 and 2838, May 14 and 21, 1920, pp. 635-641 and p. 652, 24 figs., and 670-675 and 686, 20 figs. partly on 3 supp. plates. Historical account of development. Works manufacture portable engines, road rollers, traction engines, locomobiles, fixed engines, etc.

The Works of Messrs. William Foster and Co., Ltd., Lincoln. Eng., vol. 109, no. 2843, June 25, 1920, pp. 847-850, 15 figs. partly on 4 supp. plates. Tractors, road locomotives, threshing machines, and other farm machinery are constructed. War tanks were developed in these shops.

Layout. New Plant of Gebr. Seck at Sporbitz near Dresden (Der Fabrikneubau der Mühlenbauanstalt und Maschinenfabrik vorm. Gebrüder Seck in Sportbitz bei Dresden), Gerhard Luther. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 34, Aug. 23, 1919, pp. 795-802, 16 figs. Layout of machine shops and shipping department.

Locomotive. See LOCOMOTIVES, Baldwin Works.

Ordnance. A Pioneer Ordnance Machine Shop, H. D. Parker. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 1003-1008, 7 figs. Experience of expeditionary forces in France.

Overhead Costs, Calculation of. Overhead Costs in Machine Shops (Unkostenberechnung in Maschinenfabriken), Paul Käppler. Der praktische Maschinen-Konstrukteur, vol. 53, no. 3, Jan. 22, 1920, pp. 17-21. Scheme for distributing costs among various working stages, and for calculating, from sum of these, total costs for actual production of manufactured article as well as for tools, repairs, etc.

Small Tool and Gage Shop. A British Small Tool Factory. Eng. Production, vol. 1, no. 5, May 1920, pp. 174-177, 13 figs. Details and illustrations of the works and organization of the B. S. A. Tools, Ltd., at Sparkbrook for the production of standard small tools and gages, and special jigs, fixtures, tools and special machine tools. In addition to usual chemical and physical laboratory a special department exists where research work is carried out in connection with hardening and heat treatment of metals.

Steam-Turbine Drive. See STEAM TURBINES, Machine-Shop Drive.

MACHINE-TOOL INDUSTRY

British. The British Machine Tool Industry. Machy. (N. Y.), vol. 27, nos. 1 and 2, Sept. and Oct. 1920, pp. 23-24 and 175-176. Exports and imports of machine tools, labor conditions, industrial developments and probable effect of Olympia exhibition on sales of British machine tools.

Chinese Markets. China as a Machine Tool Market, Julean Arnold. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, p. 616. Writer, who is American commercial attaché at Peking, China, gives his views of possibilities of future machine tool trade with China, and points out that Chinese engineering schools provide one of the best means for advertising American machine tools to Chinese.

Comparative Costs in U. S. and Europe. U. S. Government Sales and Belgian Machine Tool Conditions, Alexander Luchars. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 283-286. Comparison of labor and materials costs in United States, Great Britain, France, Italy, Switzerland, Holland, Germany and Scandinavia.

Development. Machine Tools, Alfred Herbert. Trans. North-East Coast Instn. of Engrs. & Shipbuilders, vol. 35, no. 5, July 1919, pp. 179-207 and (discussion) pp. 208-226, 17 figs., partly on supp. plate. Historical account of development of machine tool industry with notes on its present tendency in England and in the U. S. A.

European. Business Conditions in Europe, George R. Woods. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 393-395, 9 figs. Deals particularly with conditions which affect machine-tool industry.

Machine Tool Conditions in France, Italy, Switzerland and Holland, Alexander Luchars. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 221-222. Growth of machine-tool industry is expected to be gradual, principally because "it takes time to change the habits, ideas and industries of the people."

German. A German's View of the Industrial Situation in Germany. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 365-368. Review of present activities in German factories which make specialty of machines and machine tools, hand tools and equipment for other factories.

German Machine Tool and Related Industries, Alexander Luchars. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 223-225. Outlook for near future is qualified as uncertain because of shortage of fuel, labor difficulties and depreciated currency.

The German Machine Tool Industry. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, p. 21. Output since 1914 has increased considerably, and export of twist drills and other metal-working tools as well as of precision measuring instruments assumed large proportions during past year.

South American Trade. Future of Machine Trade with South America. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 404-405. Warning is given that "any development of the South American market will require exceedingly hard, conscientious and careful work," and that "it is not a market that will come to us without effort, nor one where great immediate results may be expected."

Spanish Trade. American Machine Tools in Spain, Ramon Casals. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 316-317. Writer believes that there is possibility of replacing German machine tools with American-made product, provided American machine-tool manufacturers are interested in this field.

Swedish Trade. Machine Tool Trade in Sweden, G. A. Lindstedt. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 328-329. It is said that general opinion which seems to prevail in United States that Swedish industries are still flush with great war profits made, is erroneous. It is added that German competition is so keen at present that it is impossible to sell American machine tools with exception of certain highly specialized types to which Germans offer no competition.

MACHINE TOOLS

Adjusting Strips, Slides, etc. Recent Machine Tool Developments, Joseph Horner. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 505-508, 46 figs. Adjusting strips, and lubrication of slides.

American, French Demand for. American Machine Tools Needed in France, L. W. Alwyn-Schmidt. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 825-826. It is pointed out that during first four months of 1919 value of American machine tools shipped to France reached $5,000,000. Factors advised to be taken into consideration in studying present and future machine-tool needs of France are destruction of industrial equipment in northeastern France and likely expansion of French iron industry following acquisition of iron mines of Lorraine.

Appraisal. See APPRAISAL, Used Machine Tools.

Counterweights for. Machine Tool Counterweights, Fred Horner. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 108-114, 17 figs. Methods of applying counterweights to different types of machine tools for counterbalancing weights of spindles, slides and work-tables.

Double Helical Gears for. Double Helical Gears for Machine Tools. Machy. (Lond.), vol. 16, no. 412, Aug. 19, 1920, pp. 605-609, 6 figs. Advantages gained by use of double helical gears, and methods employed in cutting them.

Electric Drive. See ELECTRIC DRIVE, Machine Tools.

Feed Mechanisms. Magazine Feed Mechanisms. Machy. (Lond.), vol. 16, no. 406, July 8, 1920, pp. 429-434, 12 figs. A description of mechanisms and mechanical movements used in design of magazine feeding devices for automatic machines.

Feeds and Speeds. The Androuin Progression Ratio for Speeds and Feeds for Machine Tools. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 613-616, 1 fig. Proposes progressive ratio of 1.259, that is, 1¼ approximately. It is claimed that this series ratio facilitates calculation of cutting times. Translated from Bulletin de la Société d'Encouragement pour l'Industrie Nationale.

German. The Special Exhibition of German Machine Tool Construction at Leipzig in March 1920 (Die Sonderausstellung des deutschen Werkzeugmaschinenbaus in Leipzig in März 1920). Werkstattstechnik, no. 5a, special Leipzig Exposition issue, 1920, 23 pp., 45 figs. Details of various machine-tool exhibits of 45 German factories.

Herringbone Gears for. Herringbone Gears for Machine Tools. Nikola Trbojevich. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1164-1169, 6 figs. Advantages gained by use of herringbone gears and methods employed in cutting them.

Inertia Effects. Inertia Effects in the Operation of Shop Machinery, C. E. Clewell. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 607-609, 6 figs. Discusses problem of inertia in quick acceleration and retardation of machine tools with reference to frequent reversals of planing, shaping and punching machines. Notes are included on reduction of inertia in pulleys by use of aluminum and on ways of reducing inertia in a rapidly revolving motor that is subject to frequent reversals.

International Exhibition. Machine Tools at Olympia. Eng. Production, vol. 1, nos. 10 and 11, Sept. 18 and Oct. 1920, pp. 364-398 and 409-427, 139 figs. Sept. 18: Detailed descriptions of leading exhibits; Oct.: Review of exhibits of small tools and workshop accessories. An appendix is included in which progress in machine tool industry is surveyed. Resume of salient features as evidenced at Olympia exhibition.

The Machine Tool and Engineering Exhibition at Olympia. Eng., vol. 110, nos. 2853-2856, Sept. 3, 10, 17 and 24, 1920, pp. 301-309, 333-341, 363-372, and 397-403, 194 figs., partly on 28 supp. plates. Detailed description of exhibits.

Magazine Feeds for. Magazine Feed Mechanisms, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 593-601, 19 figs. Description of mechanisms and mechanical movements used in design of magazine feeding devices for automatic machines employed by Diamond Chain & Mfg. Co. Their advantages are pointed out.

Manufacture. Machine Tool Production. Eng. Production, vol. 1, no. 8, Aug. 1920, pp. 299-305, 22 figs. Organization and methods of works of Messrs. Drummond Bros. Ltd., England.

Paris Exhibition. Machine Tools at the Paris Exhibition (Les machines-outils et l'outillage méchanique à la foire de Paris). Ouvrier Moderne, vol. 3, nos. 3, 4 and 5, June, July and Aug. 1920, pp. 111-112, 159-160 and 206-208, 10 figs. Details of principal exhibits shown at Paris exhibition held May 5-20, 1920.

Provision for Repairs. A Plea for Better Harmony Between Theory and Practice. Machy. (London), vol. 16, no. 410, Aug. 5, 1920, pp. 546-548, 5 figs. Examples of faulty designs of machine tools lacking accessibility for making repairs.

Special. The Langelier Line of Special Machinery, K. H. Condit. Am. Mach., vol. 51, Sept. 25, 1919, pp. 595-599, 15 figs. Details and illustrations of swaging and drilling machines for jobs on pistons, valves, wire spokes and crankshafts, made specially to customer's order by Langelier Mfg. Co., of Providence, R. I.

Special-Purpose Machines in the LeBlond Plant. Machy. (Lond.), vol. 16, no. 418, Sept. 30, 1920, pp. 797-803, 7 figs. Also Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 144-150, 7 figs. Vertical sawing machine built for operation customarily performed on radial drilling machines, special keyseater for long shafts, planer adapted for grinding large flat surfaces, etc.

Speeds. Geometrical Progression of Speeds in Machine Tools, C. C. Stutz. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 117-118. Method of proportioning speeds of machine tools.

See also Feeds and Speeds.

Spindles and Bearings. Recent Machine Tool Developments, Joseph Horner. Eng., vol. 109, no. 2839, May 28, 1920, pp. 707-710, 19 figs. Spindles and bearings of machine tools.

[See also BORING MACHINES; BORING MILLS; BROACHING, Machines; BROACHING PRESSES; DRILLING MACHINES; GEAR CUTTING, Machines; GRINDING MACHINES; HOBBING MACHINES; LATHES; MILLING MACHINES; MORTISING MACHINES; PLANERS; SAWING MACHINES; SCREW MACHINES; SWAGING MACHINES; TAPPING MACHINES; TOOL-GRINDING MACHINES.]

MACHINERY

Foundations. Fastening Machines to Concrete Floors and Foundations, Arthur F. Owen. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 820-821, 5 figs. Description and illustrations of common methods of fastening machine tools to concrete floors and types of drills employed

to drill holes in concrete floors and foundations.

Methods of Computing Machinery Foundations, W. H. Gilleland and A. H. Cunningham. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 387-392, 13 figs. Formulæ for computing safe bearing power of various types of foundations.

New Process of Fixing a Machine on Its Concrete Foundation (Un nouveau procédé de fixation sur les maconneries). Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 18-20, 11 figs. Bolt with cylindrical elements which press against sides of hole in masonry as nut fastening the machine is driven on bolt.

Foundations, Vibration of. The Distant Transmission of Foundation Vibration in the Operation of Engines with Reciprocating Masses (Die Fernübertragung von Bodenerschütterungen bei Maschinen mit hin- und hergehenden Massen), H. Gerb. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 38, Sept. 18, 1920, pp. 759-760, 2 figs. Is said to occur only in the case of plastic subsoil, in which the vibrations are propagated as surface waves. "Vibration dampers" are suggested as remedy for small engines, and thorough balancing of the reciprocating masses for large engines.

Power Requirements of. The Power Consumption of Machines, Hubert E. Collins. Indus. Management, vol. 60, no. 1, July 1920, pp. 35-37. Summary of records from several plants including data on drive for screw machines.

Shipment of. Insuring the Safe Shipment of Machinery, Fred H. Colvin. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 712-718, 17 figs. Methods of development by Brown & Sharpe Mfg. Co., Providence, R. I.

Vibration. See VIBRATION, Machine.

MAGNESITE

Production in 1919. Magnesite, Sodium, and Sulphur, Pyrites, and Sulphuric Acid in 1919. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 217-223. General conditions in each one of these industries are described.

Utilization of. Free Calcium Oxide in Caustic Burned Magnesium Oxide, L. H. Duschak. Cement, Mill and Quarry, vol. 17, no. 2, July 20, 1920, pp. 17-18. Paper based on results of work conducted at Bureau of Mines experiment station at Berkeley, Cal., in connection with investigation of properties and methods of utilizing western magnesite.

Washington State Industry. The Magnesite Industry of Washington, R. A. Laird. Iron Age, vol. 106, no. 10, Sept. 2, 1920, pp. 574-575, 2 figs. Extensive deposits near Spokane. Developments resulting from the war. Future of plastic magnesite in building construction.

[See also REFRACTORIES, Magnesite.]

MAGNESIUM

Analysis. See CALCIUM, Analysis.

Deoxidizers. See METALS, Deoxidizers for.

Outlook for Industry. Present Status and Outlook of the Magnesium Industry, J. T. Rooney. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 60-61. Possibilities in development of magnesium alloys of remarkable lightness and strength, together with extensive occurrence of ores, are believed to offer every encouragement to metallurgists throughout world for evolution of process for production of metal at cost which will insure its application to industry on a scale commensurate with its properties.

MAGNESIUM ALLOYS

Dow Metal. A New Light Piston Alloy. Automotive Industries, vol. 42, no. 17, April 22, 1920, p. 967. Dow metal manufactured by Dow Chemical Co. It contains over 90 per cent of magnesium, it is said, and possesses tensile strength of from 22,000 to 25,000 lb. per sq. in., modulus of elasticity of 9,000,000 lb. per sq. in. and specific gravity of 1.79.

The New Alloy of Magnesium, E. J. Jenkins. Iron Age, vol. 106, no. 4, July 22, 1920, pp. 193-194, 3 figs. Dow metal manufactured by Dow Chemical Co., Midland, Mich., said to be lightest metal known which is adapted to commercial uses. Alloy is said to be manufactured electrolytically from magnesium chloride.

Electron Metal. The Casting of Electron Metal (Ueber das Vergiessen von Elektronmetall), Felix Thomas. Stahl u. Eisen, vol. 40, no. 9, Feb. 26, 1920, pp. 290-297, 14 figs. Notes on molding sand used and its preparation; making and drying the molds; melting and casting of the electron metal (a magnesium alloy); strength and other physical properties of castings produced. Illustrations of typical castings are included.

Uses. Magnesium and Its Alloys. Their Uses and Possibilities in Foundry, A. J. G. Smout. Brass World, vol. 15, no. 12, Dec. 1919, pp. 363-364. Considerable increase in use of magnesium alloys for manufacturing various parts of aero engines is dependent, it is noted, upon developing process of manufacture which will reduce present high cost of production.

MAGNETIC ATTRACTION

Law of. Does the Quadratic Law Hold in Magnetic Attraction? (Gilt das Quadratgesetz bei der Magnetischen Anziehung?), Hans Bourquin. Elektrochemische Zeitschrift, vol. 26, no. 8-9, Nov.-Dec. 1919, pp. 86-87. Writer seeks to demonstrate that the formula, according to which the attractive force is inversely proportional to the square of breadth of air gap, is incorrect.

MAGNETIC CHUCKS

See CHUCKS, Magnetic.

MAGNETIC DECLINATION

Kew Observatory. Mean Magnetic Declination for Each Two-Hour Interval from November 30th to December 27th, 1919, as Recorded at Kew Observatory, Richmond. Trans. Instn. Min. Engrs., vol. 58, part 2, Jan. 1920, p. 156.

Relation to Weather. Perturbations of Magnetic Declinations at Lyon Observatory (Saint-Génis-Lavat) During First and Second Trimesters of 1919 (Perturbations de la déclinaison magnétique à l'Observatoire de Lyon (Saint-Génis-Lavat) pendant les premier et deuxième trimestres de 1919), Ph. Flajolet. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 23, Dec. 8, 1919, pp. 1101-1103. It is noted that tables show strong perturbations to have occurred simultaneously with settling of fair weather.

MAGNETIC FLUX

Displacement of. Flux and Current Displacement (Flussverdrängung und Stromverdrängung), F. Niethammer. Elektrotechnik u. Maschinenbau, vol. 38, no. 13, Mar. 28, 1920, pp. 141-144, 2 figs. Deals with displacement of magnetic alternating flux on surface of dynamo and transformer sheets caused by induced eddy currents therein and with displacement of alternating current on surface of conductor caused by alternating flux in interior of conductor. Writer refers to Thomson's theory for sheets and Lord Kelvin's theory for circular wires, points out that various experiments show considerable deviations from their calculated values, and seeks to explain causes of these deviations.

MAGNETIC SEPARATION

Foundry Refuse. See FOUNDRIES, Magnetic Separation of Iron from Refuse.

MAGNETIC SEPARATORS

Types. Electromagnetic Concentration and Separation of Iron Minerals and Metallurgical Waste (La concentration et la triage électromagnétiques des minerals de fer et des déchets métallurgioues), Jean Escard. Génie Civil, vol. 75, nos. 24, 25 and 26, Dec. 13, 20 and 27, 1919, pp. 603-607, 7 figs., pp. 622-627, 24 figs., and pp. 648-652, 10 figs. Particulars of construction and records of operation of Edison, Rowland, Waterhill, Humboldt, Negreanu, Blake, Steinert-Kertler, Gröndel and Luther magnetic separators.

MAGNETIC STORMS

Theory of. Note on the Theory of Magnetic Storms, F. A. Lindemann. Lond., Edinburgh & Dublin Phil. Mag., vol. 38, no. 228, Dec. 1919, pp. 669-684. It is said that existing stream theories of magnetic storms are untenable "because they require incredible radioactivity on the sun."

MAGNETIC SUSCEPTIBILITY

Measurement. The Measurement of Magnetic Susceptibilities of Low Order, Ernest Wilson. Proc. Roy. Soc., vol. 96, no. A 680, Feb. 3, 1920, pp. 429-455, 2 figs. Apparatus depends for its action upon pull exerted by electromagnet in accordance with well-known Maxwell expression for mechanical force exerted upon unit volume of substance. This mechanical force is balanced against force of torsion in a phosphor-bronze strip.

Molecular Constitution and Temperature. The Influence of Molecular Constitution and Temperature on Magnetic Susceptibility, Part IV—Further Applications of the Molecular Field, Major A. E. Oxley. Phil. Trans. Roy. Soc. of London, Series A, vol. 220, no. 8, pp. 247-289, 6 figs. After presenting summary of previous papers, writer discusses (1) energy and ultimate tensile strength associated with crystalline media or gels, (2) elastic constants of various media, (3) change of volume on crystallization, (4) nature of molecular field, (5) magnetic theory of chemical combination, and (6) anomalies of Faraday effect.

MAGNETIC TESTING

Long Rods. Magnetic Testing of Straight Rods in Intense Fields, W. L. Cheney. Sci. Papers Bur. Standards, no. 361, Feb. 21, 1920, pp. 625-637, 12 figs. Modification of isthmus method which is adapted to testing of long, straight specimens is described. Data are given to illustrate accuracy of method as compared with standard method.

Mechanical Testing and. Magnetic and Mechanical Testing of Iron. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 708-712, 14 figs. Survey of experiments conducted by various investigators with a view to establishing relation between magnetic and mechanical properties of iron materials.

MAGNETISM

Reactive Power and Magnetic Energy. Reactive Power and Magnetic Energy, Joseph Slepian. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 5, May 1920, pp. 448-454, 6 figs. Relation between reactive power and magnetic and electrostatic energies is stated and proved and its utility is illustrated.

Terrestrial. Organization of Researches on Terrestrial Magnetism (Organisation des recherches du magnétisme terrestre), E. Mathias. Revue générale de l'Electricité, vol. 8, no. 9, Aug. 28, 1920, pp. 259-263. Scheme of organization for conducting coöperative research in astronomical observatories in France and its colonies.

Terrestrial, Horizontal Intensity of. Electrical Method for Determining Horizontal Intensity of Magnetism of Earth (Elektrische Methode zur Bestimmung der Horizontalintensität des Erdmagnetismus), W. Uljanin. Terrestrial Magnetism and Atmospheric Electricity, vol. 24, no. 3, Sept. 1919, pp. 118-131, 1 fig. Description of method of observation and of instruments used.

MAGNETIZATION

Curves. The Reversible Permeability on the Ideal Magnetization Curve (Die reversible Permeabilität auf der idealen Magnetisierungskurve), Richard Gans. Annalen der Physik, vol. 61, no. 4, Feb. 22, 1920, pp. 379-395, 12 figs. Account of experiments to determine whether reversible permeability (a certain quantity defined and named by author in previous works) showed same value as function of magnetization on so-called ideal magnetization curve, obtained by method developed by Steinhaus and Gumlich. Tests were made with hard steel, soft steel, soft iron and nickel, and results with soft iron coincided with theory; in case of steel and nickel, deviations were shown, but so slight that practically the entire reversible permeability curve can be calculated from the initial permeability and the saturation magnetization. Report from Physical Inst. of La Plata (Argentine Republic).

Residual. Relation Between Residual and Spontaneous Magnetization and Temperature (Sur la dépendance entre l'aimantation rémanente, l'aimantation spontanée et la température), Albert Perrier and G. Balachowsky. Archives des Sciences physique et naturelles, vol. 2, no. 5, Jan.-Feb. 1920, pp. 5-29, 5 figs. Results of experiments with iron and nickel bars are given in diagrammatic and tabular forms. It appears that spontaneous magnetization as well as residual magnetism vary according to same law.

Vibration and. On the Magnetic Effects of Vibration in Iron Rods, A. O. Rankine. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 528-532, 1 fig. Experiments carried out indicated that complex magnetic changes are produced in an iron bar by its own vibrations.

MAGNETOS

Aircraft. British Standard Specification for Magnetos for Aircraft Purposes. British Eng. Standards Assn., no. 86, July 1919, 27 pp. 23 figs. Only dimensions which affect interchangeability of magnetos as a whole are dealt with.

British Thomson-Houston. British Thomson-Houston Magneto Methods, I. W. Chubb. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 670-674, 9 figs. Process of manufacturing these magnetos at branch works of British Thomson-Houston Co.

Brolt. The Brolt Electrical Installation. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 14-15, 7 figs. Self-regulating machine with fan ventilation.

Energy in Magnetic Circuit. On the Energy in the Magnetic Circuit of a Magneto, N. W. McLachlan. Elecn., vol. 85, nos. 2202 and 2203, July 30 and Aug. 6, 1920, pp. 128-130 and 156-158, 7 figs. July 30: Mathematical method of computing energy in magnetic circuit of magneto. Aug. 6: Equation of magnetic circuit in case where gap is constant and equivalent and actual lengths of horns and central portion of armature are variable.

French Machines. Magneto Industry in France (L'industrie de la magnéto d'allumage en France), H. W. Porret. Technique Moderne,

vol. 12, nos. 1 and 3, Jan. and Mar. 1920, pp. 25-28, 17 figs., and 125-129, 30 figs. High-tension machines with special reference to types used in automobiles.

High-Tension, Characteristics of. Characteristics of High-Tension Magnetos. Nat. Advisory Committee for Aeronautics, report no. 58, 1920, 23 pp., 22 figs. Analysis of successive operations, showing connection between several phenomena concerned and their relative importance on basis of energy transformed. Method for measuring ratio of turns of high-tension magnetos or induction coils is suggested and result of its application to various magnetos is quoted.

Ignition. A Gaging Fixture for the Relation of the Cams to Keyway. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, p. 257, 1 fig. Device for measuring angular relation of breaking point on cam and keyway on shaft of ignition magnetos.

Comparative Merits of Dixie Magnetos and Delso Battery Ignition System When Used on a Liberty "12" Aero Engine. Aviation, vol. 8, no. 7, May 1, 1920, pp. 291-292. Tests showed no appreciable difference in power or freedom from fouling of spark plugs. From Air Service Information Circular.

Magnets for. See STEEL, Magnet.

Magnets for Testing. Criteria for the Testing of Magneto Magnets, J. D. Morgan. Electrician, vol. 84, no. 2172, Jan. 2, 1920, pp. 4-6, 6 figs. Discusses relative value of B.H. curves, measurements of magnetic qualities of material from which magneto is made, and tests for permanence of magneto magnets.

Power Requirements. Power Required to Drive Aeronautic Engine Magnetos and Generators. Air Service Information Circular, vol. 1, no. 42, July 30, 1920, 1 p. Power absorbed in driving Liberty generator ranged from 0.07 hp. at 1800 r.p.m. when delivering current of 1 ampere, to 0.19 hp. at 3300 r.p.m. when delivering current of 4 amperes.

Primary Current at Break. An Experimental Method of Determining the Primary Current at Break in a Magneto, N. W. McLachlan. Phys. Soc. of London, vol. 32, part 1, Dec. 15, 1919, pp. 38-53, 9 figs. A condenser is connected across secondary winding to reduce voltage below that necessary to cause sparking at safety gap. Peak voltage due solely to interruption of current at any speed is found. Interrupted direct current necessary to give same peak voltage is also found by using calibrating circuit.

Splitdorf. A Few Splitdorf Details, S. A. Hand and K. H. Condit. Am. Mach., vol. 53, nos. 2 and 3, July 8 and 15, 1920, pp. 78-80 and 127-130, 19 figs. Principle of operation and process of manufacture.

Wico. The New Wico Magnetos. Gas Engine, vol. 22, no. 9, Sept. 1920, pp. 258-260, 6 figs. Magnetos are of magnetic-bridge type.

Two Types of Magneto that Employ the Magnetic Bridge Principle. Automotive Industries, vol. 43, no. 6, Aug. 5, 1920, pp. 256-257, 4 figs. Wico magnetos. One has reciprocating armature and in the other armature is on periphery of flywheel.

MAGNETS

Permanent. Dependence of Temperature Coefficients of Permanent Magnets on Their Form (Ueber die Abhängigkeit des Temperaturkoeffizienten permanenter Magnete von deren Gestalt), E. Gumlich. Annalen der Physik, vol. 59, no. 7, Sept. 4, 1919, pp. 668-688, 6 figs. Experimental determination of distribution of lines of force in a simple horseshoe magnet, both open and closed. Information from Natl. Physical and Tech. Inst.

Permanent Magnets in Theory and Practice, S. Evershed. Elecn., vol. 84, nos. 2193, 2194 and 2195, May 28, June 4 and 11, 1920, pp. 591-592, 616-618 and 643-644 and (discussion) pp. 644-645, 6 figs. Abstract of paper read before Instn. Elec. Engrs. Outlines theory of permanent magnetism favored by author and describes equations. It is concluded that although it has hitherto been natural to use metals which normally possess powerful inherent magnetomotive forces, choice of material for permanent magnets is not necessarily so restricted; and future discovery may result in conversion of a so-called non-magnetic element into a magnetizable substance in which the effective molecular currents will surpass those of iron in their strength (as indicated by the Heusler alloys).

Steel for. See STEEL, Magnet.

Testing. A New Magnet-Testing Instrument, A. Bursill. Lond., Edinburgh, and Dulbin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 542-545, 4 figs. Instrument consists mainly of new hand-driven d.c. generator, wound to generate unvarying voltage of about 100 when magnetic flux is due to ordinary magneto magnet and speed is normal.

[See also ELECTROMAGNETS.]

MALLEABLE CASTINGS

Annealing. Anneal Malleable in Tunnel Kiln, H. E. Diller. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 638-644, 11 figs. Kiln of tunnel type used for continuous annealing at plant of Saginaw Malleable Iron Co.

Heat Treatment. See Uses.

MALLEABLE IRON

Annealing Ovens. New Oven Secures Uniform Anneal. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 768-771, 11 figs. Two fireboxes at each side are in oven proper. Flues are located in center of floor. Four tons of castings are annealed with one ton of coal.

Castings. See MALLEABLE CASTINGS.

Foundry. See FOUNDRIES, Malleable-Iron.

Grain of. The Fine Structure of Malleable Iron in Connection with Its Tensile-Strength Properties (Ueber das Kleingefüge des Tempergusses in Zusammenhang mit seinen Festigkeitseigenschaften), Rudolf Stotz. Stahl u. Eisen, vol. 40, no. 30, July 29, 1920, pp. 997-1002, 42 figs., 36 on 3 supp. plates. Discussion with the aid of photographs of the fine grain of high- and low-grade malleable iron and foundry pig iron, and especially of the production of the skin by annealing. Results of investigations carried out in the material-testing department of the A. Stotz Corp., Stuttgart-Kornwestheim.

Melting. Melting Iron with Powdered Coal. Foundry, vol. 48, no. 4, Feb. 15, 1920, pp. 136-139 and 150, 4 figs. Details and illustration of powdered-coal burning system and equipment used with malleable-iron air furnace. Comparison with handfiring is said to show economy of new installation.

Properties. Variables Bias Malleable Tests, H. A. Schwartz. Iron Trade Rev., vol. 67, no. 6, Aug. 5, 1920, pp. 371-373, 5 figs. Relation between tensile strength and percentage of elongation and diameter of rough and machined specimens is shown in graphically expressed data. Paper read before Am. Soc. for Testing Materials.

Research Work. Research Work on Malleable Iron, Enrique Touceda. Can. Foundryman, vol. 10, no. 12, Dec. 1919, pp. 357-359, and vol. 11, nos. 1, 2 and 6, Feb. and June 1920, pp. 16-17, 4 figs., 40-41 and 148-149, 16 figs. Results of 4 years of research work for American Malleable Casting Assn.

Strength. Malleable Strong in Thick Sections. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 906-908, 6 figs. Center of 3-in. square bar was found to possess tensile strength of 40,000 lb. per sq. in.

Strive for Strength in Malleable, H. E. Diller. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 803-807, 19 figs. Experience of company which formerly made railroad castings and has recently engaged in automobile work.

[See also PULVERIZED COAL, Melting Iron with.]

MANAGEMENT

Industrial (Scientific). See INDUSTRIAL MANAGEMENT.

Statistics, Value of. Commercial Statistics and Their Value to the Executive, G. P. Baldwin. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 648-652, 7 figs. Graphical methods are suggested for preparing statistics for number of orders taken, amount of sales made, and expense incurred by sales office.

MANGANESE

Alloys. Manganese-Bismuth, Manganese-Zinc and Manganese-Silver Alloys. (Die Legierungen: Mangan-Wismut, Mangan-Zink und Mangan-Silber), Paul Siebe. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 3, Oct. 1, 1919, pp. 161-183, 3 figs. Metallographic report from the Physical-Chemical Inst. of the University of Göttingen. Diagrams and structure of the three alloys are given.

See also ALLOYS, Manganese—Gold.

Mining in Georgia. Mining Manganese in Georgia, Marshall Haney. Iron Trade Rev., vol. 66, no. 25, June 17, 1920, pp. 1762-1763 and 1766-1767, 3 figs. Producers look to Congress for enactment of reasonable tariff to eliminate many of their difficulties. Cartersville district may be one of most prosperous in South. Nature of deposits and how ore is mined and washed.

Ore. See MANGANESE ORE.

Ore Smelting, Electric. Electric Furnace Smelting of Montana Manganese Ores, E. S. Bardwell. Gen. Meeting of Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 14, pp. 137-152; also in Chem. & Metallurgical Eng., vol. 22, no. 15, Apr. 14, 1920, pp. 681-685. Description of plant of Anaconda Copper Co. at Great Falls, Mont., for reducing Montana rhodochrosite manganese ores. Detailed description is given of furnace, electrode holders, and operation of furnaces.

Production in 1919. Manganese, Tungsten, Vanadium, Uranium, Radium, Arsenic, Molybdenum in 1919. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 208-216. Statistics of production.

MANGANESE BRONZE

See BRONZES, Manganese.

MANGANESE ORE

Arkansas Deposits. Hausmannite in the Batesville District, Arkansas, H. D. Miser and J. G. Fairchild. Jl. Wash. Acad. Sci., vol. 10, no. 1, Jan. 4, 1920, pp. 1-8. Results of mineralogical analysis of manganese ore.

Arizona Deposits. Deposits of Manganese Ore in Arizona, E. L. Jones and F. L. Ransome. Dept. of Interior, U. S. Geological Survey, 1 Bul. 710-D, Jan. 29, 1920, pp. 93-184, 14 figs. Total production to Dec. 31, 1918, in Arizona of manganese ore containing more than 35 per cent of manganese was over 32,000 tons. Topographical and geological features of each district are given.

California Deposits. An Interesting Occurrence of Manganese Minerals near San Jose, California, Austin F. Rogers. Am. Jl. Sci., vol. 48, no. 288, Dec. 1919, pp. 443-449. Specimen made largely of pyrochroite.

Deposits of Manganese Ore in Southeastern California, Edward L. Jones, Jr. Dept. of Interior, U. S. Geological Survey, Bul. 710-E, Dec. 30, 1919, pp. 185-208, 1 fig. Geography and topography of region and description of ore deposits.

Idaho Deposits. See MINERALS, Deposits, Idaho.

India Deposits. Manganese-Ore Mining in India, E. N. T. Slater. Eng. & Min. Jl., vol. 109, no. 21, May 22, 1920, pp. 1155-1159, 7 figs. Rich deposits in jungle were worked by open pits, gravity planes being used for collecting ores at loading points. Condition and prospects of industry are noted, together with marketing of ores in England.

Southern U. S. Manganese Ores of the Southern States, George W. Stose. Eng. & Min. Jl., vol. 110, no. 6, Aug. 7, 1920, pp. 256-262, 7 figs. Character of deposits and mode of occurrence of ores in southern Appalachian and Arkansas districts.

MANGANESE STEEL

Electric. Electric Steel, G. N. Somerville. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 124-127, 5 figs. Comparison of steels produced by converters and electric methods. Practice of Am. Manganese Steel Co. for making manganese steel in Héroult electric furnace.

Grinding. Grinding Manganese Steel, R. M. Johnson. Iron Trade Rev., vol. 66, no. 14, Apr. 1, 1920, pp. 999-1001, 10 figs. Methods employing swing frame grinding machines are illustrated.

Open-Hearth. Making Manganese Steel by the Open-Hearth Process, E. L. Shaner. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp. 63-66, 8 figs.; also Iron Trade Rev., vol. 65, no. 25, Dec. 25, 1919, pp. 1701-1705, 10 figs. Special attention is called to method of adding alloy and quenching heat-treated castings.

Properties. Properties of Manganese Steels, Jerome Strauss. Proc. Steel Treating Research Soc., vol. 2, no. 11, 1920, pp. 14-19 and p. 47, 8 figs. Table of elastic limits, ultimate strengths, and elongations of copper, nickel and manganese steels. By manganese steels are meant those which contain over 1 per cent manganese.

MANHOLES

Cost Estimating. Estimating Manhole Costs, E. E. George. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 231-233, 1 fig. Method is described by which it is said two men can price from field notes 100 manholes an hour and come within 5 per cent of theoretical accuracy.

MANJAK

Properties and Uses. Properties and Uses of Manjak, W. C. Phalen. Dept. Interior, Bur. Mines, Monthly Reports of Investigations, no. 252, Oct. 27, 1919, 3 pp. Characteristic properties of deposits of this bitumen found in Barbados, West Indies, and in Utah, Cuba and Trinidad.

MANNESMANN TUBES

See TUBES, Seamless, Manufacture of.

MANOMETERS

High-Pressure. Short Manometer for Measuring High Pressure. Power, vol. 51, no. 17, Apr. 27, 1920, pp. 658-659, 2 figs. H. C. Dickenson, physicist of Bur. of Standards, described

form of manometer used at bureau, principle of which is use, in series, of several manometers of reasonable length so connected that any number of them may be used.

Low-Pressure. The Production and Measurement of High Vacua—IV, Saul Dushman. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 731-740, 10 figs. Manometers for low gas pressures, specially McLeod gage and different forms of viscosity gages.

Multiple-Tube. A Multiple-Tube Manometer, A. F. Zahm. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919, pp. 771-774, 3 figs. For measurement of pressure distribution over aerodynamic models. Apparatus is composed of numerous tubes arranged side by side and adjustable to various sensibilities. Type described was developed in Aerodynamical Laboratory of Bur. of Construction & Repair.

[See also OXYGEN, Pressure Measurement.]

MANUFACTURING

Component-Part System of. Component-Part System of Manufacturing, Sterling H. Bunnell. Eng. and Indus. Management, vol. 3, no. 4, Jan. 22, 1920, pp. 101-102. Success of system is attributed to interchangeable-part system of manufacture, as perfected in America.

Multiple Method. See SCREW MACHINES, Multiple Manufacture on.

[See also INTERCHANGEABLE MANUFACTURE.]

MAPPING

Aerial Photography in. Aeroplane Photography as an Adjunct to Military Mapping, J. H. Wheat. Military Engr., vol. 12, no. 61, Jan.-Feb., 1920, pp. 11-12. Writer states that the air photograph needs control to fix its correct position on planimetry; therefore where no base maps are available, it will be necessary to do certain amount of triangulation and establish secondary control graphically, by means of plane table, locating road junctions, church spires, bridges, etc., by means of which restitution of photograph may be accomplished.

The Airplane in Surveying and Mapping, E. Lester Jones. Military Engr., vol. 12, no. 61, Jan.-Feb. 1920, pp. 9-11. Writer points out that aeroplane can now furnish maps of low order of accuracy, so far as scale and position of features are concerned, which will be valued in many branches of industry and commerce. Abstract of paper presented before Pan-American Aeronautic Convention.

The Tri-Lens Camera in Aerial Photography and Photographic Mapping, J. W. Bagley. Military Engr., vol. 12, no. 64, July-Aug. 1920, pp. 358-363, 5 figs. Difficulties attendant upon adaptation of aerial photography to map work. Description of Bagley tri-lens camera which was developed with a view to covering maximum area of ground at single exposure.

French Artillery Methods. Heavy Coast Artillery, D. A. Tomlinson. Jl. Western Soc. Engrs., vol. 24, no. 6, June 1919, pp. 375-398, 7 figs. Lambert projection and system of coördinates adopted by U. S. Coast and Geodetic Survey and U. S. Geol. Survey, and surveying methods adapted for map work by heavy artillery section of French army.

Mathematical Cartography. Progress in Mathematical Cartography, Charles H. Deetz. Pacific Mar. Rev., vol. 17, no. 6, June 1920, pp. 109-112, 4 figs. Account and illustrations of Lambert's zenithal projection, an outline base map of United States on Lambert zenithal equal-area projection, scale 1: 7,500,000, dimensions 19¾ in. by 25¾ in., which has recently been issued by U. S. Coast and Geodetic Survey. Discussion of the Mercator projection.

[See also AERIAL PHOTOGRAPHY, Chart Drawing; FORESTRY, Use of Seaplanes in; SURVEYING, Aeroplanes in.]

MAPS

Relief, Multiple Production of. Multiple Production of Relief Maps, Louis M. Manheimer and Frank T. Fuller. Military Engr., vol. 12, no. 62, Mar.-Apr. 1920, pp. 121-125, 5 figs. Account of a process evolved as result of extended study by the Corps of Engrs., whereby relief maps are made formed solely of paper, which are said to be true representations of terrain and which can be produced in quantity by such talent as may usually be found in an engineer organization at reasonable expenditure of time and money.

MARBLE

Resources of U. S. Our Marble Resources. Stone, vol. 40, no. 12, Dec. 1919, pp. 554-556. Extent and character of marble deposits in Vermont, Tennessee, Georgia, New York, Massachusetts, Alabama and Missouri.

MARINE BOILERS

Combustion-Chamber Temperature, Measurement. Observing Temperatures in Marine Propelling Installations. Engr., vol. 129, no. 3348, Feb. 27, 1920, pp. 226-228, 10 figs. Diagrams are presented which show results of measuring temperatures in combustion chambers in multitubular marine boiler by means of thermocouples. Paper read before Northeast Coast Instn. Engrs. & Shipbuilders.

Corrosion, Prevention of. Preventing Corrosion in Marine Boilers, F. N. Speller, E. G. Bashore, Isaac Harter and W. W. Smith. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 421-426, 3 figs. Survey of practice.

Emergency Fleet. Boilers of the New Emergency Fleet, Jos. J. Nelis. Boiler Maker, vol. 20, nos. 1 and 2, Jan. and Feb., 1920, pp. 1-6 and 37-45, 20 figs.; also Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 17-29, 15 figs. Comparative results obtained with Scotch and water-tube boilers. Relative costs and weights and service records. Details of construction.

E. F. C. Water-Tube Boiler for Wood Ships, F. W. Dean and Henry Kreisinger. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 943-948, 5 figs. Tests upon standardized water-tube boiler designed by U. S. Shipping Board Emergency Fleet Corporation. Boilers had grate area of 65.54 sq. ft., heating surface of 2500 sq. ft. and commercial horsepower of 435 on basis of marine rating of 6 lb. of water to square foot of heating surface per hour.

Heating Surface. Boiler Heating Surface, G. J. Wells. Trans. Inst. Mar. Engrs., vol. 30, no. 240, Jan. 1919, pp. 291-299 and (discussion) pp. 299-312. Various types of boilers are studied and results of experiments are presented to emphasize that area of heating surface is not so directly of importance as the way in which it is arranged.

Oil Burners for. See OIL FUEL, Marine Boilers.

Scotch, Design of. Standardization of Scotch Boilers, Henry C. E. Meyer. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 117-122, 11 figs.; also Boiler Maker, vol. 19, no. 12, Dec. 1919, pp. 351-355, 11 figs. Application of standardization and graphical methods to design of cylindrical return tubular boilers. Two types of Scotch boilers are considered, those with separate combustion chambers and those with common combustion chamber. Paper read before Soc. Naval Arch. & Mar. Engrs.

Scotch vs. Water-Tube. Scotch Boilers versus Water Tube Boilers for Merchant Marine Ships, Henrik Greger. Pac. Mar. Rev., vol. 16, no.

12, Dec. 1919, pp. 78-81, 3 figs. It is concluded that Scotch boilers, because of their universal use and reliability, safety and ease of operation, are not likely to be discarded until type is offered having not only equivalent reliability and safety but greater economy. Water tube boilers are believed fast proving themselves able to fill these requirements, but in view of many previous failures builders and owners are cautioned to discriminate carefully in regard to designs of water tube boilers.

Stokers for. See STOKERS, Marine-Boiler.

Water-Tube vs. Cylindrical. Water-Tube versus Cylindrical Boilers in the Mercantile Marine, A. Spyer. Steamship, vol. 31, no. 371, May 1920, pp. 257-260. Universal adoption of water-tube boilers in world's navies is pointed out. Its slow adoption in mercantile navy is attributed to difficulty of determining best type to use, necessity of fresh water feed and increased initial and maintenance cost. Paper read before Liverpool Eng. Soc.

[See also BOILERS, WATER-TUBE, E.F.C. Marine; Houghton's Patent.]

MARINE ENGINES

American. Marine Motors "Built in U. S. A." Motor Boat, vol. 17, no. 8, April 25, 1920, pp. 21-31. List compiled from reports of manufacturers in April 1920, and arranged alphabetically under names of manufacturers.

British. The Marine Engine as Great Britain Has Developed It, M. W. Bourdon. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 951-955, 15 figs. Review of British practice based on models exhibited at Olympia Show.

Cylinder Repairs. Repairing of German Vessels Taken by Brazilian Government (Note sur les réparations des navires allemands saisis au Brésil), G. Bourgés. Bulletin Technique du Bureau Veritas, vol. 2, no. 5, May 1920, pp. 85-89, 16 figs. Cylinders were broken by German crews. Repairing consisted of assembling broken parts and fastening them mechanically with joining pieces secured in various ways to cylinder parts. Examples are described.

Diesel. See DIESEL ENGINES; Cammellaird-Fullagas; Marine; Two vs. Four-Cycle; Trend in Marine Types.

Gas. See GAS ENGINES, Gorham.

Gasoline. See GASOLINE ENGINES, British Marine, Specifications.

Heavy-Oil. Marine Heavy-Oil Engine Installation Practice and Development Possibilities, Hubert C. Verhey. Jl. Soc. Automotive Engrs., vol. 6, no. 5, May 1920, pp. 344-351 and (discussion) pp. 351-360, 9 figs. Popular exposition of working principles of types of two and four-cycle engines now in actual operation in cargo ships.

See also HEAVY-OIL ENGINES, Bolinder.

Kermath Vanadium 20. Introducing a New Marine Motor. Motor Boating, vol. 25, no. 3, Mar. 1920, p. 34, 3 figs. Kermath Vanadium 20 adopted by International Shipbuilding and Marine Eng. Corpn. for their standardized cruisers.

Kerosene. See KEROSENE ENGINES, Marine.

Oil. See OIL ENGINES, Bergsund; Marine; Neptune.

Semi-Diesel. See SEMI-DIESEL ENGINES.

Siemens Revolution Indicators. Siemens Patent Engine Revolution Indicators. Steamship, vol. 31, no. 368, Feb. 1920, pp. 185-186, 2 figs. Apparatus is operated electrically, current for working indicator on bridge being produced inductively.

Standard. Standard Marine Engines. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 754-756. It is pointed out that a start has already been made on North-East Coast (England) in regard to standardization of engines, but it is impossible to produce standard engines unless in a standard works, and that is why there is difficulty in proposing a single standard for whole country.

Still vs. Sulzer. Comparative Trials of "Still" and "Sulzer" Engines Under Actual Working Conditions on Board Ship, William Denny. Mar. Engr. & Naval Architect, vol. 43, no. 515, Aug. 1920, pp. 8-11, 7 figs. Both types were found to be satisfactory in trials.

Triple-Expansion. Guidance Specification for Reciprocating Triple Expansion Marine Engines for Cargo Vessels (1920). Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 6, Apr. 1920, pp. 315-320. Refers to engines up to 3500 indicated horse power normal at sea, and deals with proportions and scantlings of main engines only. Compiled by Council and members of Instn., 1917, and revised annually once.

Valve Gear, New. New Valve Gear Adds Power, H. Penton. Mar. Rev., vol. 50, no. 3, Mar. 1920, pp. 138-140. Tests on two similar vessels each equipped with triple-expansion engine of like horsepower but with different types of valve gear conducted on Great Lakes by officers of United States Shipping Board Emergency Fleet Corporation. Fuel Saving is said to have resulted with poppet valves actuated by modified Walschaerts gear.

Vertical Quadruplex-Expansion Type. Machining and Erecting Marine Engines, William Wylde and R. M. Sherman. Int. Mar. Eng., vol. 25, no. 4, April 1920, pp. 305-318, 21 figs. Practice at shops of Newport News Shipbuilding and Dry Dock Company, Newport News, Va. Engine, construction of which is described, has cylinders 24 in., 35 in., 51 in., and 75 in. in diameter, by 51-in. stroke, Stephenson link-valve gear and is designed for 2600 i.hp. at 70 r.p.m.

[See also INTERNAL-COMBUSTION ENGINES, Olympia Show.]

MARINE FITTINGS

Characteristics. Marine Brass Goods and Fittings, Peter W. Blair. Metal Industry (N. Y.), vol. 18, no. 8, Aug. 1920, pp. 351-352, 6 figs. Characteristics of marine fixtures as distinguished from standard lines.

MARINE STEAM TURBINES

Flexible Expansion Coupling. The "Robertson-Fairfield" Flexible Expansion Coupling. Eng., vol. 110, no. 2854, Sept. 10, 1920, p. 357, 5 figs. Coupling consists of casing or shell made in halves which are bolted together when coupling is assembled. "Pivot keys sockets" fitted in slots machined in casing, transmit drive to casing. Any relative axial motion between drivers and driving shaft is provided for by sliding these blocks along their slots in shell.

Geared. Building the Westinghouse Marine System. Machy. (Lond.), vol. 15, no. 369, Oct. 23, 1919, pp. 97-102, 11 figs. Machining operations involved in the making of shafts and turbine reduction gear.

Geared Turbines for Merchant Ships. Shipbuilding and Shipping Rec., special number, Jan. 7, 1920, pp. 23-28, 5 figs. Comparison of reciprocating engines and gear turbines on merchant ships. Westinghouse-Rateau type of turbine is illustrated.

Geared Turbines for Standard Ships of the N. 1 Class. Shipbuilder, vol. 22, no. 116, April 1920, pp. 234-239, 7 figs. Turbines designed for normal maximum output of 2300 s.hp.

with provision for overload to 2900 s.hp. with dry saturated steam at 190 lb. per sq. in. and vacuum of 28 in., barometer standing at 30 in. They are of multi-stage impulse type and have high-pressure and low-pressure units in separate casings.

Geared Turbines with Double Reduction Gear. Eng., vol. 110, no. 2850, Aug. 13, 1920, pp. 211-212 and p. 214, 9 figs. partly on 2 supp. plates. Turbines are designed to develop aggregate of 3000 hp. Three are ahead turbines arranged in series and two astern turbines fitted, respectively, within low-pressure and intermediate pressure casings. High-pressure and intermediate turbines both gear with one wheel. Low-pressure gears with second wheel on opposite side of propeller shaft. Installation was constructed by the Parsons Marine Steam Turbine Co., Ltd., for S. S. "Corrientes."

See also REDUCTION GEARS.

Governors. Emergency Governor and Gear for Marine Turbine. Eng., vol. 110, no. 2854, Sept. 10, 1920, pp. 344-345, 8 figs. Type being introduced by Messrs. Aspinall's Patent Governor Co., Liverpool.

Westinghouse Marine Turbine Governor. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 766-767, 4 figs. Governor is of centrifugal type. Has arrangement for automatic control of steam and water supply to glands, which prevents leakage where rotor emerges from casing on both high- and low-pressure turbines.

High-Speed Impulse Type. High-Speed Impulse Type Marine Turbines. Shipbuilding & Shipping Rec., vol. 15, no. 11, March 11, 1920, pp. 337-340, 7 figs. Units constructed for ship propulsion by Fraser & Chalmers Engineering Works, Erith, England.

Main Exhaust Pipes. Design of Main Exhaust Pipes for Turbines, Cyrus Hankins. Int. Mar. Eng., vol. 25, no. 7, July 1920, pp. 583-586, 8 figs. Details of various types, with notes on fitting of expansion joints.

Monel-Metal Blades. Monel-Metal Blades in Destroyer Turbines, W. F. Rice. Power, vol. 51, no. 23, June 8, 1920, pp. 908-911, 8 figs. Bethlehem Shipbuilding Corporation put into service during last two years upward of 100 destroyers, all of which were fitted with monel turbine blading. It is stated that in no case has monel blading been found to be in bad condition.

Rateau. The Development of the Rateau Geared Turbine for Marine Work, A. V. Jarratt. Elecn., vol. 85, no. 2207, Sept. 3, 1920, pp. 253-257, 6 figs. Rateau turbines as manufactured by Metropolitan-Vickers Electrical Co., Ltd. Turbine is constructed with two cylinders, high and low pressure, mounted side by side, both driving high-speed pinions on reduction gearings.

Reduction-Geared. See Geared, Rateau.

Reduction Gears. See REDUCTION GEARS.

Service Records. The Application of Geared Turbines to Merchant Ships, R. J. Walker. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 3, Jan. 1920, pp. 73-88 and (discussion) pp. 88-126, 14 figs., 10 on 10 supp. plates. Includes data giving service results of several steamers with geared turbines of Parsons type as compared with service results of similar vessels fitted with reciprocating engines, showing saving in coal in favor of geared turbine ships. Describes two principal types of high speed marine turbines, the impulse and the reaction.

Steels for. See STEEL, Turbine.

Vibration in. Vibration in Ship Turbines (Schwingungen bei Schiffsturbinen), H. Hülcker. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 31, July 31, 1920, pp. 603-605, 4 figs. Frequent turbine disturbances which occurred on a torpedo boat could only be attributed to vibrations of the turbine rotor. Investigation by means of pallographs could not be completed. Opinions of several authorities in regard to case are recorded.

MARINE TERMINALS

See TERMINALS, MARINE.

MASH COOKERS

Heat Transmission in. See HEAT TRANSMISSION, Mash Cookers.

MASTS

See RADIOTELEGRAPHY, Italian Navy.

MATERIALS

Ductile, Resistance of. On the Resistance of Ductile Materials to Combined Stresses in Two or Three Directions Perpendicular to One Another, H. M. Westergaard. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 627-640, 9 figs. Various theories for determining resistance of materials to combined stresses are discussed. In particular stress-solid resulting from application of maximum shear and maximum strain theory is indicated.

Elastic Limit. See ELASTICITY, Strain-Energy Function.

Fatigue in. The Engineering Relations of Shock and Fatigue, Walter Rosenhain. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1293-1296, 2 figs. Distinction between "fatigue" and "shock" of materials.

Fracture of. See FRACTURE.

Handling. See HANDLING MATERIALS.

Plastic. See PLASTIC MATERIALS.

Properties at High Temperatures. The Effect of Temperature on Some of the Properties of Materials, F. C. Lea. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 293-298, 31 figs. Results of experiments with aluminum alloys, alloy steels, and concrete cylinders. It was found, for example, for mild steel that maximum strength is passed at 235 deg. cent. At temperatures beyond 300 deg. cent. strength diminished very rapidly and at temperatures from 615 to 640 deg. cent. breaking strength was less than 7 tons per sq. in. Paper read before Eng. Section, British Assn. for Advancement of Science.

Repeated-Stress Safety Factors. Repeated-Stress Safety Factors Quickly Determined, J. B. Kommers. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 393-394. Table of factors based on unit stress and on repetition. Goodman's diagram and recent test data used.

Strength and Suitability. The Strength and Suitability of Engineering Materials, C. F. Jenkin. Engr., vol. 130, no. 3374, Aug. 27, 1920, pp. 200-201. Presidential address to Eng. Section, British Assn. for Advancement of Science.

Testing. Compares Fatigue and Recovery, Robert G. Guthrie. Iron Trade Rev., vol. 67, no. 13, Sept. 23, 1920, pp. 843-845, 4 figs. Instruments for determining recoverance, which is capacity of material to return immediately energy that has been imparted to it by any external force. Records of operation of machine.

MATHEMATICS

See ALGEBRA; CURVES; FINITENESS; FUNCTIONS; GEOMETRY; GROUPS; HARMONIC MEAN; INTEGRALS; JACOBIANS; MECHANICS; POLYNOMIALS; POTENTIALS; PROBABILITY; SERIES; SUR-

FACES, Ruled; TRANSFORMATIONS; TRIGONOMETRY.

MATTER

Atom Models. A Modification of the Bohr Atom Model (Ueber eine Modifikation des Bohrschen Atommodells), F. Kirchhof. Zeitschrift für Physikalische Chemie, vol. 93, no. 5, Sept. 26, 1919, pp. 623-633, 1 fig. Discussion of hypothesis of P. Debye based on characteristic Röntgen spectra, which gives first or center ring 3 electrons, the next 7, the third 8, and so on. Table is presented giving arrangement of electrons based on this hypothesis, and it is pointed out that relation is shown to exist between presence of certain series with development of certain rings.

Atomic Collisions. Atomic Projectiles and Their Collisions with Light Atoms, Ernest Rutherford. Science, vol. 50, no. 1299, Nov. 21, 1919, pp. 467-473. On method of calculating number of recoil atoms scattered through any given angle through direction of flight of alpha particles. Address delivered before Royal Inst. of Great Britain.

Atoms. See ATOMS.

Equation of State. On the Equation of State, M. P. Applebey and D. L. Chapman. London, Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, no. 236, Aug. 1920, pp. 197-200. Van der Waals equation is deduced.

Structure of. Atoms and Molecules, Jean Becquerel. Sci. Am. Supp., vol. 88, no. 2,285, no. 8, 1919, pp. 260-263, 11 figs. An elementary explanation of modern methods of proving their existence.

Atoms and Molecules, Frederick Soddy. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 230-233. Lines of evidence which have led to present conception of their structure.

The Influence of Investigations on the Electrical Properties of Gases on Our Conceptions of the Structure of Matter, J. Thomson. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 224-225. Review of progress during last 50 years.

The Nature of the Forces Between Atoms in Solids, Ralph W. G. Wyckoff. Jl. Wash. Acad. Sci., vol. 9, no. 19, Nov. 19, 1919, pp. 565-592. It is emphasized that only arrangement of outside electrons has bearing on phenomena usually included under term chemistry. Several typical compounds are considered with reference to nature of forces producing them. Solid substances are classified, according to nature of forces of combination, into molecule-forming, polar and valency compounds.

[See also ATOMS, STRUCTURE OF; GRAVITATION; MOLECULAR VOLUME.]

MEASURING INSTRUMENTS

Harmonic Analyzer. A Simple Harmonic Analyzer, V. Bush. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 903-905, 4 figs. Mechanical integrator.

Torque Meter. New Apparatus for the Control of Machine Operation (Einiges über neuzeitliche Betriebskontrolle), R. Uhlmann. Der praktische Maschinen-Konstrukteur, vol. 53, no. 4, Jan. 29, 1920, pp. 9-12, 3 figs. Benzinger's torque meter, an apparatus which accurately records the load over a given period on the machine to which it is attached.

Two-Needle. New Type of Apparatus for the Direct Measurement of Magnitudes which are Functions of Two Variables (Sur une nouvelle classe d'appareils de mesure pour l'evaluation directe des grandeurs fonctions de deux variables), L. Barbillion and M. Dugit. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 7, Aug. 17, 1920, pp. 389-392. Instruments using two needles, one curvilinear and one rectilinear, or both curvilinear, turning about the same axis. As examples are quoted an instrument for measuring relative velocity of an aeroplane, and an indicator of carburation in explosion motors.

MEASURING MACHINES

Manufacturing. See LATHES, Pit.

Modulimeter. The Widney Modulimeter. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 254-256, 2 figs. Machine for measuring recoverance. of .material. . Recoverance is "capacity of material to return immediately the energy that has been imparted to it by any external force."

Universal. A Universal Measuring Machine. Am. Mach., vol. 53, no. 2, July 8, 1920, pp. 49-53, 14 figs. Construction and method of operation of machine designed for accurate measurement of pieces of all shapes. Machine is intended as primary standard of measurement for use chiefly in making and checking gages. It has been made for some time in Switzerland, although it is said to be a new machine to this country.

Universal Measuring Machine. Engr., vol. 129, no. 3358, May 7, 1920, pp. 472-473, and p. 476, 9 figs. partly on 2 supp. plates. Type designed by Société Genevoise d'Instruments Physique of Geneva, which is said to enable absolute measurement to be made with accuracy of 0.00005 in.

MEASUREMENTS

See METRIC SYSTEM; OCTAVAL NOTATION.

MECHANICAL SCIENCE

Progress Since 1870. Developments of Mechanical Science, W. C. Unwin. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 241-243. Historical survey of modification of steam engine since 1869 and development of various types of internal-combustion engines.

Perfection of Mechanical Apparatus Developed During the Last Fifty Years, J. R. Bibbins. Jl. Western Soc. Engrs., vol. 24, no. 8, Oct. 1919, pp. 491-496. Notes particularly advent of steam turbine, heavy-duty gas engine and producer and use of by-product gases from blast furnaces and coke ovens.

MECHANICS

Cyclic Motions. Cyclic Motions With or Without Vortices (Sur certains mouvements cycliques avec ou sans tourbillons), Henri Villat. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 449-451. Equations in case of annular fluid domain in which there exist cyclic configurations containing vortices arranged at vertices of regular polygon.

Problem of Three Bodies. Nature of Motion in the Problem of Three Bodies When Time Increases Indefinitely (Sur l'allure du mouvement dans le problème des trois corps quand le temps croît indéfiniment), Jean Chazy. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1560-1563. Seven types of trajectories are enumerated.

Solutions of the Problem of Three Bodies When the Lines Joining the Three Bodies Form as Isosceles Triangle (Sur les solutions du problème des trois corps où les trois corps forment un triangle isoscéle), Jean Chazy. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 526-529. Five movements pointed out—Lagrange's, Euler's, movement admitting axis of symmetry, movement admitting plane of

symmetry, and limit of two preceding movements.

[See also ATTRACTION, Planetary; DYNAMICS; GRAVITATION; IMPACT; ROTATION.]

MECHANISMS

See CRANK MOTION.

MELTING POINTS

Determination. Melting Point Methods at High Temperatures, Leo I. Dana and Paul D. Foote. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 23-28, 11 figs. Description of determination of melting points of metals, alloys, salts and refractory materials by use of thermoelectric, resistance and optical pyrometers.

MENTAL HYGIENE

See HEALTH, Mental Hygiene.

MERCHANT MARINE

American. Suggestions for the Profitable Operation of the American Merchant Marine, H. C. Dinger. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 806-810. Concerning coöperation of labor and capital as means for producing more tonnage at cheaper rate per ton.

Labor Problem. The Labor Problem and Its Influence Upon the Merchant Marine of the Future, Waldon Fawcett. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 513-515. Opinion is expressed that one solution for American labor problem in maritime industries and for high costs of operation is to be found in employment of vessels of maximum size.

MERCURY

Colloidal. Preparation of Colloidal Mercury by Cathodic Dispersion (Ueber die Bereitung von kolloidem Quecksilber durch kathodische Zerstäubung, A. Gutbier and G. L. Weise. Kolloid-Zeitschrift, vol. 25, no. 3, Sept. 1919, pp. 97-100, 1 fig. Experiments are said to have shown that pure water should not be used for dispersion, but a solution of any suitable protective colloid in proper concentration.

Determination in Organic Matter. The Determination of Mercury, C. M. Bouton and L. H. Duschak. Dept. of Interior, Bur. of Mines, Paper 227, 1920, 44 pp., 7 figs. Method developed by Bur. of Mines for use in study of mercury condenser losses, and especially for determination of minute amounts of mercury associated with organic matter.

Vapor Pressures. The Vapor Pressures of Mercury in the Range 120 deg. to 250 deg., Alan W. C. Menzies. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1783-1787, 1 fig. Measurement by method involving use of two McLeod gages, hot and cold respectively.

MERCURY BOILERS

Emmet. See BOILERS, Mercury.

METAL DRAWING

Pneumatic Die Cushions. Pneumatic Cushions in Metal Drawing Operations. Machy. (Lond.), vol. 16, no. 404, June 24, 1920, pp. 367-369. Description of various types of pneumatic die cushions used in connection with punch presses, and methods of installing.

METAL SCRAP

See SCRAP, Metal.

METAL SPRAYING

Methods. Metal-Spraying Methods in Art and Industry (Die Metallspritzverfahren in Kunst und Industrie). Der praktische Maschinen-Konstrukteur, vol. 53, nos. 7 and 9, Feb. 19 and Mar. 4, 1920, pp. 27-30 and 36-38, 3 figs. Deals with Schoop metal-spraying process and the various discoveries of Thurston, Morf, and others.

Pistol for. An Acetylene Metal-Spraying Pistol (Eine Acetylen-Metallspritzistole), K. Matzinger. Autogene Metallbearbeitung, vol. 13, no. 5, Mar. 1, 1920, pp. 59-62, 2 figs. Describes new apparatus developed by author which is said to have many advantages over the illuminating-gas and hydrogen pistols, and which includes a mechanism for automatically feeding the metal wire, which is situated by a small gas turbine fed from the pistol.

Schoop Process. A Simplified "Schoop Pistol," M. V. Schoop. Metal Industry (Lond.), vol. 16, no. 3, Jan. 16, 1920, pp. 41-42, 3 figs. New feed of wire-spraying pistol consists mainly in pushing wire to be moved into interior of hollow axle of turbine causing wire to engage with several dies, which are provided with thread-like pressure faces and rotate with axle of turbine.

The Schoop Metal-Spraying Process and Its Prospects (Das Metallspritzverfahren nach Schoop und seine Aussichten), Robert Hopfelt. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 30, July 24, 1920, pp. 578-579. According to experiments made with process up to present time, tin-spraying cannot be recommended, whereas with zinc and lead good results have been obtained. Metal coating of wood, paper and textiles has not proved advantageous.

Strength. See GALVANIZING, Modern Practice.

METAL WORK

Inlaid Work. A New Art Industry, Eugen Werner. Metal Industry (Lond.), vol. 16, no. 15, April 9, 1920, pp. 285-286 and p. 296. Possibility of instituting mass production of inlaid metal work is discussed. Translated from Galvanoplastite und Metallbearbeitung.

[See also TANSIA WORK.]

METALLOGRAPHY

Etching. Study of the Oberhoffer Modification of the Rosenhain Etching Reagent (Beitrag zur Kenntnis des von Oberhoffer abgeänderten Rosenhainschen Aetzmittels), Ad. Fry. Stahl u. Eisen, vol. 40, no. 18, May 6, 1920, pp. 622-623, 3 figs. Results of tests are said to confirm Oberhoffer's theory that by using the reagent the concentration variations of phosphorus are brought out more clearly.

Instruments Adapted to. The Microscope as Used in the Study of Metals, W. L. Patterson. Proc. Steel Treating Research Soc., vol. 2, no. 11, 1920, pp. 26-37, 27 figs. Instruments best adapted to metallography.

Non-Ferrous Castings. Metallography in the Detection of a Substituted Test Coupon, D. J. McAdam, Jr., and Gilbert E. Doan. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 481-487, 13 figs. Experience in application of metallography to inspection of nonferrous castings. It was desired to determine history of castings by metallographic analysis.

Testing Equipment. Metallography in the Workshop (Metallographie in der Werkstatt), M. v. Schwarz. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 31, July 31, 1920, pp. 589-592, 30 figs., on 2 supp. plates. Gives examples illustrating application of metallographic investigations by operating engineer by simple macrographic means; segregation in low-carbon steel; influence of the manufacture and treatment on strength of materials; location of welds and soldered places; testing of hard-

ness; metallographic equipment for small works.

[See also RADIOMETALLOGRAPHY.]

METALLURGICAL MILLS

New York District. Metallurgical Plants in the Vicinity of New York, Edward H. Robie. Eng. & Min. Jl., vol. 109, no. 24, June 12, 1920, pp. 1299-1301, 1 fig. Account of mines, mills, smelters, and refineries within a radius of thirty miles from heart of city. Copper and tin refineries said to be of particular importance and even steel industry is represented.

METALLURGY

Complex Ores. The Reduction of Complex Ores and Metallurgical Products (Die Verarbeitung komplexer Erze und Hüttenprodukte), W. Hommel. Metall u. Erz, vol. 16, nos. 21 and 23, Nov. 8 and Dec. 8, 1919, pp. 501-511 and 559-576. Brief discussion of physical separation methods followed by lengthy discussion of wet and dry metallurgical separation processes. Notes on smelting of ore, production of residues rich in lead, and direct refining of metals containing zinc and lead, in connection with dry processes; separation by means of sulphuric acid and sulphurous acids, hydrochloric acid or chlorine, alkalines and ammonia, etc., describing numerous European and American processes.

Electricity in. Eee ELECTRICITY, APPLICATIONS OF, Metallurgy.

Standardization in. Rulings of the Permanent Commissions of Standardization in Regard to Metallurgical Product (La commission permanente de standardisation ses décisions au point de vue des matériaux métallurgiques), Léon Guillet. Revue de Métallurgie, vol. 17, no. 6, June 1920, pp. 408-420, 5 figs. Rulings in regard to testing machines, methods of testing and nature of tests to be made of metallurgical products, especially steel.

Theoretical. Notes on Theoretical Metallurgy (Betrachtungen zur theoretischen Metallhüttenkunde), W. Guertler. Metall u. Erz, vol. 8, no. 8, Apr. 22, 1920, pp. 192-195, 2 figs. Writer points out that theory of chemical equilibrium which in the last decade has contributed so largely to progress in organic and inorganic chemistry and in metallography, if applied to metallurgy, would effect a great saving in work in the development of technical methods, in working out new processes and in solving theoretical problems, and example is given to confirm this assumption.

Tonnage of Products. Formulas for Determining the Tonnage of Products From Metallurgical Operations, A. H. Heller. Min. & Sci. Press, vol. 120, no. 16, April 17, 1920, pp. 575-576. Three-product formula for mill work is developed.

METALS

Alkaline, Luminescence of. See LUMINESCENCE.

Analysis of. Analysis of Metals by Electrolysis Without Using External Source of Electrical Energy (Sur un procédé de dosage des métaux par dépot électrolytique sans emploi d'une énergie électrique extérieure), Maurice François. Annales de Chimie, vol. 12, Sept.-Oct. 1919, pp. 178-192, 1 fig. Solution under examination is placed in platinum crucible. Across border of crucible nickel bar is placed which supports zinc element immersed in salt. Analysis is made by measuring deposit collected at bottom of crucible.

Progress in Metal Analysis in 1917 and 1918 (Fortschritte auf dem Gebiete der Metallanalyse in den Jahren 1917 und 1918), Th. Döring. Chemiker-Zeitung, vol. 43, nos. 114, 118, 120 and 122, pp. 626-628, 653-655, 665-668 and 681-684. Analyses of lead and arsenic. Analyses of antimony, bismuth, manganese, and iron. Determination of phosphorus in pig iron and steel carried out alkalimetrically; determination of chrome in iron ore and ferrochrome; colorimetric process for determination of wolfram in solution of alkali-wolframate.

Atomic Structure. Atomic Structure of Metals in Solid Solution, A. L. Feild. Chem. & Metallurgical Eng., vol. 21, no. 11, Oct. 29 and Nov. 5, 1919, pp. 566-570, 3 figs. Experimental data on specific resistance, general considerations as to hardness, and electronic theory are said to indicate that solid solutions contain large amount of supercooled metal with liquid or amorphous structure.

Brilliant, Luminosity of. See BLACK BODY, Luminosity of.

Calorizing. Calorizing. Gas Engine, vol. 22, no. 6, June 1920, p. 170, 3 figs. Describes method of increasing life of metals subjected to high temperatures.

Cold Work, Effect of. The Effect of Cold Work on the Metals and Alloys, Owen W. Ellis. Metal Industry (Lond.), vol. 15, nos. 21, 22, 23 and 24, Nov. 21, 28, Dec. 5 and 12, 1919, pp. 425-429, 448-450, 465-469 and 482-485, and vol. 16, nos. 1 and 2, Jan. 2 and 9, 1920, pp. 4-6 and 21-24, 32 figs. It is concluded from technical study said to have been confirmed with experimental evidence that at "certain stage in deformation the resistance of the metal or alloy to further reduction in the rolls remains more or less constant over a certain 'critical'." Articles describing experiments to determine effect of cold work on density; results of various hardness tests, and theories advanced by different investigators to account for continuity of structure and for remarkable changes in mechanical and physical properties of cold-worked metals and alloys. "Season cracking" of brass is attributed primarily to internal stresses.

Compressive Strength. Resistances of Metals and Alloys to Compression (Widerstand von Metallen und Legierungen gegen Druck), A. Pomp. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 37, Sept. 11, 1920, pp. 745-746, 1 fig. Results of investigation of lead, lead and tin alloy, copper, brass, aluminum, low carbon steel, and steel with 5 per cent carbon, are given in tabular form and in curves.

Crystal Growth and Recrystallization. Crystal Growth and Recrystallization in Metals, H. C. H. Carpenter and Miss C. F. Elam. Eng., vol. 110, nos. 2855 and 2856, Sept. 17 and 24, 1920, pp. 385-389 and 424-426, 38 figs. Sept. 17: Results obtained in experiments with cold-rolled aluminum sheets and with an alloy of tin and antimony containing 1.5 per cent antimony, are studied in light of theories explaining crystal growth and recrystallization. It is shown how these results deprecate such theories. Modifications as to theories are suggested. Sept. 24: Among facts observed are that growth may take place either of large crystal into smaller one, or of small into larger, that relative orientation of crystal which is being grown into and that which is growing does not appear to affect growth, and that rate of growth is not constant for any given time at any particular temperature. (Abstract.) Paper read before Inst. of Metals.

Damascening. New Method of Damascening Metals. Scientific Am. Monthly, vol. 2, no. 1, July 1920, pp. 42-45. Improvements and simplifications by aid of photography.

Deoxidizers for. Magnesium as a Scavenger of Metals, J. T. Rooney. Metal Industry, vol. 17, no. 12, Dec. 1919, p. 511. Advantage of magnesium over other deoxidizers.

Electron Theory. An Extension of the Electron Theory of Metals, A. E. Caswell. Physical Rev., vol. 15, no. 1, Jan. 1920, pp. 1-11, 1 fig. The concentration of free electrons and positive centers computed from thermoelectric data, is said to indicate that the observed differences of electrical conductivity among the various metals depend principally upon differences in concentration of positive centers.

Elongation. Influence of Length of Bar on Elongation (Einfluss der Stablänge auf die Dehnung), M. Rudeloff. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 215, 1919, 80 pp., 27 figs. Treatise on proportion in elongation resulting from tensile strength tests of specimens having length of $1 = 5d$ and $1 = 10d$.

Expansion. Stretched Wire Apparatus for Measuring Thermal Expansions, Arthur W. Gray. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 667-671, 6 figs. Equipment used at Bureau of Standards for determining expansivity of material in form of bars.

Fatigue of. Fatigue of Metals Under Repeated Stress, H. F. Moore and J. B. Kommers. Iron Age, vol. 105, no. 23, June 3, 1920, pp. 1595-1598, 6 figs. Also Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 368-372, 4 figs. Report of progress in investigation under joint auspices of National Research Council, Engineering Foundation and Illinois Engineering Experiment Station. It has been found that fatigue failure follows path through crystal grains themselves rather than along their boundaries. Thus primary cause of fatigue failure is said to be localized deformation. Paper read before Am. Iron and Steel Inst.

Fatigue of Metals under Repeated Stress, Herbert F. Moore. Jl. Western Soc. Engrs., vol. 24, no. 6, June 1919, pp. 331-336 and (discussion) pp. 336-340, 4 figs. Endurance diagram for various metals tested under repeated stress.

Fusion and Thermal Conductivity. On the Variation of Thermal Conductivity During the Fusion of Metals, Seibei Konno. Sci. Reports Tôhoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 169-179, 6 figs. partly on two suppl. plates. Thermal conductivity of tin, lead, zinc and aluminum was found to decrease gradually with rise of temperature up to melting point and abruptly during melting. It is noted that changes of thermal conductivity corresponded to those of electric conductivity for same metals.

Grain Refinement. Fundamental Principles in the Grain Refinement of Metals (Grundprinzipien der technologischen Kornverfeinerung), J. Czochralski. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 1, Aug. 1919, pp. 3-6, 1 fig. It is asserted that the greatest progress in the knowledge of the internal phenomena in connection with recrystallization has been achieved through author's assumption that the closest analogy exists between the recrystallization phenomena and phenomena occurring at crystallization; and author claims that this development was reached by means of results of O. Lehmann's investigations and his own confirmation of their adaptability to metals after repeated experiments.

Grease Removal. Ethylene Trichloride as Grease-Removing Medium in the Metalware Industry (Trichloräthylen als Entfettungsmittel in der Metallwaren-Industrie), E. Krause. Das Metall, vol. 1919, no. 22, Nov. 25, 1919, pp. 301-303, 1 fig. Chlorated hydrocarbons were used during the war as substitutes for benzine, benzol, petroleum, etc., for removing grease from ground or polished metal parts, and of these C_2HCl_3, commonly called "tri," has proved most valuable and has the advantage over benzine and petroleum of being fire- and explosion-proof. Description of process and apparatus used in this connection.

Hardness Measurement. The Measurement of the Hardness of Metals, Hugh O'Neill. Iron & Coal Trades Rev., vol. 100, no. 2726, May 28, 1920, pp. 737-739, 8 figs. Notes on indentation tests in which surface of metal is permanently distorted by pressure of ball, cone or knife edge, and abrasion tests in which particles of material are torn away by a harder one; advantages and defects of Brinell test; description of new commercial instrument known as magnetic instrument with which coercive force can be determined in two simple operations occupying about two minutes' time, etc. Paper read before Sheffield University Met. Soc.

Melting Points. See MELTING POINTS.

Physics of. The Physics of Metals, Zay Jeffries. Jl. Cleveland Eng. Soc., vol. 12, nos. 2 and 3, Sept.-Nov. 1919, pp. 65-99, 46 figs. Illustrated with photomicrographs.

Porosity, Determination of. Apparatus for the Determination of the Porosity of Metals, F. K. Bezzenberger and R. A. Wilkins. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1031-1032, 2 figs. Apparatus for testing ability of non-ferrous castings to hold air pressure without leaking.

Progress in 1919. The Year's Progress in Metals. Metal Industry (N. Y.), vol. 18, nos. 1 and 2, Jan. and Feb. 1920, pp. 16-17 and 85-86. Survey of important work conducted in United States and England on metals and alloys. Abstracts are presented of important articles which have appeared in technical papers in both countries.

Protective Coatings. See METAL SPRAYING.

Radiographic Testing. See RADIOMETALLOGRAPHY, Apparatus; Research.

Radiography of. The Radiography of Metals, J. Hall-Edwards. Metal Industry (Lond.), vol. 16, no. 11, Mar. 12, 1920, pp. 213-217, 11 figs. Brief explanation of how the X-rays are produced and some of their properties, and résumé of what so far has been achieved in examination of materials and products by means of the rays. He concludes that although science of radiometallography has achieved much, it cannot truthfully be said to have advanced far beyond experimental stage. Paper before Birmingham Inst. of Metals at Birmingham University.

Research. See Progress in 1919.

Rigidity of. Note on the Influence of Temperature on the Rigidity of Metals, A. Mallock. Proc. of Roy. Soc., vol. 97, no. 687a, Aug. 3, 1920, pp. 450-455, 2 figs. Experiments showed that the more fusible the metal the less is rigidity affected by change of temperature.

Rolling, Strains in. Investigation of Strains in Rolling of Metal, Alfred Musso. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 937-938, 3 figs. Experimental investigation to determine most convenient length and width of piece of metal to be rolled in order to produce finished article of certain definite dimensions so that waste of material may be reduced to minimum.

Rupture of. Theory of Plasticity and Rupture of Isotropic Solids (Théorie de la plasticité et de la fragilité des solides isotropes), Marcel Brillouin. Annales de Physique, vol. 13, May-June, 1920, pp. 217-235, 1 fig. Discusses formulating law of rupture of metals.

Season Cracking. Season Cracking, W. H. Hatfield. Engineering, vol. 108, no. 2805, Oct. 3, 1919, pp. 456-460, 20 figs. Results of investigations in which writers endeavored particu-

larly to determine effect of cold work and internal stresses introduced thereby into metals, whether non-ferrous or ferrous. Photomicrographs are presented. Paper read before Inst. of Metals.

Sheet, Testing. The Testing of Sheet Metals, A. G. C. Gwyer. Metal Industry (Lond.), vol. 16, no. 3, Jan. 16, 1920, pp. 42-45, 6 figs. Hardness tests are discussed with special reference to scleroscopic, punching, and cupping tests.

Solidification of. Second Report to the Beilby Prize Committee of the Institute of Metals on the Solidification of Metals from the Liquid State, Cecil H. Desch. Metal Indus., vol. 15, no. 16, Oct. 17, 1919, pp. 325-331 and (discussion) pp. 331-332, 9 figs. Deals with form of crystal grains and their relation to foam structures, and solidification of liquids exhibiting cellular convection structure.

See also SOLIDIFICATION, Phenomena of.

Solution in Acids. The Solution of Metals in Acids as Related to Corrosion, William D. Richardson. Gen. Meeting of Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 15, pp. 153-186. In consistent behavior of metals in corrosion and acid solution phenomena is explained by taking into consideration number of factors, as solution tension, influence of hydrogen, oxygen, carbon dioxide, cathode and halogen.

Standardization. Reports Before the Sub-Committee of Soc. German Met. & Min. Engrs., on Standardization of Metals and Metal Alloys (Berichte für den Unterausschuss für die Normung von Metallen und Metallegierungen). Metall u. Erz, vol. 16, no. 24, Dec. 22, 1919, pp. 591-600. Includes recommendations of Dr. Doerinckel on standardization of the most important brass and bronze alloys; recommendations of Dr. Philippi and Prof. Bauer on nomenclature and standardization of bronzes; of E. H. Schulz on nomenclature of copper alloys; and tabular data on properties of copper-zinc alloys, and examples of standard sheets for bronze and brass.

Substitute. Economical Substitute Metals (Betrachtungen über Sparmetalle), Albert Würth. Stahl u. Eisen, vol. 40, nos. 13 and 17, Apr. 1 and 29, 1920, pp. 421-426 and 568-575, 50 figs. It is demonstrated that for construction of Diesel engines and centrifugal pumps, as well as for valves and cocks, and especially for shell fuses, good results can be obtained by use of substitute metals, but for steel apparatus they have not proved satisfactory. Writer defines limitations in use of the substitute metals and tells how difficulties which arise can be overcome.

Sulphide. See SULPHIDE METALS.

Testing. Mechanical Testing of Metals (La pratique des essais méchaniques des métaux), Jean Durand. Génie Civil, vol. 77, no. 1, July 3, 1920, pp. 8-11, 4 figs. Rules defining testing practice, formulated by Commission permanente de Standardisation.

Testing Metals under Repeated Stress, H. F. Moore and J. B. Kommers. Iron Trade Rev., vol. 66, no. 23, June 3, 1920, pp. 1615-1616, 6 figs. Discussion of stresses and fatigue strength of metals.

Thermoelectric Power. Thermoelectric Power of Pure Metals (Sur le pouvoir thermoélectrique des métaux purs), H. Pelabon. Annales de Physique, vol. 13, May-June 1920, pp. 169-187, 15 figs. Results of experiments. Graphs are given showing temperature against thermoelectric power for combinations of platinum and each one of several other metals. Thermoelectric power was found to vary continuously with temperature.

Uncommon. Uncommon Ores and Metals, H. C. Meyer. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 233-234. Properties and market conditions of beryllium, cerium, selenium, strontium, thorium, titanium and zirconium.

X-Ray Studies. Some Studies of Metals by Means of X-Rays, S. Nishikawa and G. Asahara. Physical Rev., vol. 15, no. 1, sec. series, Jan. 1920, pp. 38-45, 18 figs. on 3 supp. plates. By passing a narrow beam of heterogeneous rays through a thin sheet of metal, a pattern may be photographically recorded which depends on crystalline structure of metal. Authors have used this phenomenon to study effect of rolling and subsequent annealing on various metals, and results are given in the case of various metals. It was shown that the various metals differ greatly in their response to annealing.

[See also CHEMICAL ANALYSIS, Metals, X-Ray.]

METEOROLOGY

Action Between Sea and Atmosphere. Temperature Variations in the North Atlantic Ocean and in the Atmosphere, Björn Helland-Hansen and Fridtjof Nansen. Smithsonian Misc. Coll., vol. 70, no. 4, 1920, 408 pp., 112 figs. Investigations of action which thermal condition of ocean exercises upon air circulation and air temperature.

Aeronautics, Relation to. Meteorology and Aeronautics. Air Service Information Circular, vol. 1, no. 77, May 12, 1920, 8 pp., 2 figs. Location and layout of flying fields, exploration of upper air, forecasts, light charts and magnetic charts.

Air Density at Different Altitudes. Elementary Theory of Terrestrial Refraction and of Atmospheric Reflections (Elementare Theorie der terrestrischen Refraktion und der atmosphärischen Spiegelungen), Joseph Würschmidt. Annalen der Physik, vol. 60, no. 2, Oct. 7, 1919, pp. 149-180, 11 figs. It is stated that on assumption of a linear variation of temperature it is proven by integration of differential equation of statics of atmosphere that density of air varies with altitude, the density decreasing as long as temperature increases with altitude or remains constant or decreases to less than 3.4 per cent.

Ascensional Velocity of Sounding Balloons. Sounding of the Atmosphere by Means of Free Rubber Balloons (Sondages de l'atmosphère à Gâvre au moyen de ballons libres en caoutchouc), M. F. La Porte. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 5, Feb. 2, 1920, pp. 279-282. Empirical formula for ascensional velocity is formed from results of observations.

Atmosphere, Upper Layers of. Relation Between the Movements and the Temperatures of the Upper Layers of the Atmosphere (Sur la relation entre les mouvements et les températures des hautes couches atmosphériques), V. Bjerknes. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 10, March 8, 1920, pp. 604-606. Theory is advanced that in lower layers of atmosphere temperature increases from poles to equator, and in upper layers temperature increases from equator to poles. Reasoning is based on equation for equipotential surface in atmosphere resulting from gravitational attraction and centrifugal force.

Temperature of the Upper Layers of the Atmosphere (Sur la température des hautes couches atmosphériques), V. Bjerknes. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 12, March 22, 1920, pp. 747-750. Temperature of atmospheric layers above cyclones and anti-cyclones is calculated from

differential equation expressing temperature conditions of surface of separation between stratosphere and troposphere.

Atmospheric Eddies. The Supply of Energy from and to Atmospheric Eddies, Lewis F. Richardson. Proc. Roy. Soc., Series A, vol. 97, no. A 686, July 1, 1920, pp. 354-373. Paper extends Reynold's theory of the criterion of turbulence, to make it apply to the case in which work is done by the eddies, acting as thermodynamic engines in a gravitating atmosphere.

Atmospheric Temperature. Inversions of Temperature in the Lower Layers of the Atmosphere in the Antarctic (Inversions de température dans les couches basses de l'atmosphère dans l'Antarctique), J. Rouch. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 10, Sept. 6, 1920, pp. 498-500, 1 fig. Observations at Petermann Island (lat. 65 deg. 10 min. S., long. 66 deg. 34 min. W., Paris).

Atmospheric Turbulence. Taylor's Theory of Atmospheric Turbulence, Eric R. Miller. Monthly Weather Rev., vol. 47, no. 10, Oct. 1919, pp. 703-706. Turbulence is regarded as made up of eddies and an eddy is considered as air that moves from a stratum where it has the same temperature, humidity, and momentum as its surroundings to another stratum with which it mixes.

Climate Control. Factors of Climatic Control, W. J. Humphreys. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919 and vol. 189, no. 1, Jan. 1920, pp. 775-810 and 63-98, 15 figs. Dec.: Discussion of principal factors, and effects of their possible changes, that determine various averages and extremes of weather of any given place. Question is studied from viewpoint of physics and not of geographic distribution. Jan.: Graphs indicating relation of pyrheliometric values and mean temperature departures to sun-spot numbers and violent volcanic eruptions.

Evaporation Stations. Instructions for the Installation and Operation of Class "A" Evaporation Stations, Benjamin C. Kadel. Dept. of Agriculture, Weather Bur., Circular L, Instrument Division, 1919, 30 pp., 7 figs. Equipment needed and instructions for installing it.

Free-Air Conditions. Average Free-Air Conditions as Observed by Means of Kites at Drexel Aerological Station, Nebr., During the Period November 1915, to December 1918, inclusive, Willis Ray Gregg. Monthly Weather Rev., vol. 48, no. 1, Jan. 1920, pp. 1-11, 8 figs. Tables and figures are given indicating monthly, seasonal and annual values of different elements at various levels up to 5 km. Data are compared with similar data for Mount Weather, Blue Hill and elsewhere, and separate table contains comparative values of air density as determined by different investigators for various parts of the world.

Hail, Prevention of. Preventing Formation of Hail by Aeroplane (L'aéroplane et la grêle), G. M. Stanoievitch. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1590-1592. Opinion is expressed that formation of hail could be prevented by repeated passages of aeroplanes through clouds.

High Altitudes. Meteorological Characteristics of Atmosphere at High Altitudes (Les caractères météorologiques de la haute atmosphère), J. Rouch. Aérophile, vol. 28, nos. 13-14, July 1-15, 1920, pp. 210-217, 3 figs. Survey of researches. Compilation of data obtained.

Kite Balloon. An Improved A. P. Kite Balloon, J. F. Boyle. Aviation, vol. 9, no. 3, Sept. 1, 1920, pp. 89-91, 2 figs. Gas bag is nearly spherical in shape. Ballonet is forward and is similar to Caquot ballonet. Mooring band is catenary type, with 15 mooring points. Rip panel is in shape of inverted V and straddles nose of gas bag.

Magnetic Storms. Magnetic Storms, C. Chree. Jl. Instn. Elec. Engrs., vol. 57, no. 285, Aug. 1919, pp. 591-609, 11 figs. Synchronous phenomena observed at stations in widely different parts of the earth.

Pilot-Balloon Flights. Note on Pilot-Balloon Flights in a Thunderstorm Formation, Ivan R. Tannehill. Monthly Weather Rev., vol. 47, no. 10, Oct. 1919, pp. 725-727, 3 figs. Horizontal projections of balloon paths during storm.

Pressure and Weight of Air vs. Altitude. Experimental Laws of Variation of Barometric Pressures and Specific Weight of Air with Altitude (Lois experimentales des variations de la pression barometrique et du poids spécifique de l'air avec l'altitude), Rodolphe Soreau. Aérophile, vol. 27, no. 21-22, Nov. 1-15, 1919, pp. 335-342, 1 fig. Barometric formulæ derived from fundamental differential equation combining pressure, specific weight and altitude. Records of observations at various places are also given.

Solar Radiation and Weather. Variation in Solar Radiation and the Weather, H. Helm Clayton. Smithsonian Misc. Coll., vol. 71, no. 3, Jan. 15, 1920, 53 pp., 22 figs. Tables and data giving meteorological data obtained at Buenos Aires, Argentine Republic, are presented and formula is developed in endeavor to correlate temperature and solar radiation of different intensities.

Temperature Equation. Determination of Normal Temperatures by Means of the Equation of the Seasonal Temperature Variation and a Modified Thermograph Record, F. L. West, N. E. Edlefsen and S. Ewing. Jl. Agricultural Research, vol. 18, no. 10, Feb. 16, 1920, pp. 499-510, 6 figs. It is illustrated how equation can be derived from observations of Weather Bureau for determining normal temperature at certain place at an assigned hour of day on particular day of year.

Upper Atmosphere. Characteristic Properties of Air at High Altitudes (Les propriétés caractéristiques de l'air aux hautes altitudes), A. Lapresle. Aérophile, vol. 28, nos. 5-6, March 1-15, 1920, pp. 66-71, 3 figs. Based on data obtained at Aeronautical Observatory at Lindenberg, Germany.

Vertical Distribution of Condensation Cores in Free Atmosphere (Die vertikale Verteilung der Kondensationskerne in der freien Atmosphäre), Albert Wigand. Annalen der Physik, vol. 59, no. 8, Sept. 19, 1919, pp. 689-742, 15 figs. Results of measurements of condensation cores and meteorological elements with special regard to air stratification to height of 9000 meters. Modifications of laws for variation of quantity of cores with altitude are explained.

See also Atmosphere, Upper Layers of.

Weather Forecasting. Forecasting the Weather by Means of Cirrus (Sur l'utilisation des cirrus pour la prévision du temps), G. Reboul and L. Dunoyer. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 12, March 22, 1920, pp. 744-747. Coefficients of certitude of rules given in meteorological treatises for forecasting weather from observations of cirrus are calculated from records of meteorological bureau.

Prediction of Weather Conditions (Om Vær- og Stormvarslinger), V. Bjerknes. Teknisk Ukeblad, vol. 67, no. 22, May 28, 1920, pp. 300-307, 11 figs. Uses of radiotelegraphy in weather forecasting. Scheme for efficient weather prediction throughout the world.

The Use of Solar Radiation Measurements for Weather Forecasting in Argentina, C. G.

Abbot. Jl. Washington Acad. Sciences, vol. 10, no. 8, April 19, 1920, pp. 226-235, 1 fig. Principle of system consists in considering sun as variable star. It is said that changes in solar constant of radiations are followed by terrestrial effects which become noticeable in atmosphere from 3 to 17 days after solar event occurs. Graphs are presented giving observed variations of solar radiation in various observatories in Argentine and the subsequent variations in temperature of atmosphere.

Wind Pressure, Measurement of. Paradoxical Windwheels and Soaring Birds, Thomas O. Perry. Sci. Am. Monthly, vol. 1, no. 3, Mar. 1920, pp. 205-207, 3 figs. Experiments are outlined for illustrating rotary thrust produced without weather angle, and apparatus is described for weighing pressure of wind in axial direction.

Wind Velocity. Wind Velocity in the Stratosphere (Sur la vitesse du vent dans la strotosphère), Ch. Maurain. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1419-1420. Tabulated results of observation with sounding balloons at altitudes from 11,000 m. to 19,000 m. Mean velocities given vary from 8 to 14 m. per sec.

[See also AEROPLANES, Aerophysical Investigations with; AVIATION, Weather Conditions, Effects of; BALLOONS; MAGNETIC DECLINATION, Relation to Weather.]

METHANE

Mixtures with Oxygen and Carbon. The Equilibrium Between Carbon, Hydrogen, and Methane, Hubert Frank Coward and Stanley Pierce Wilson. Jl. Chem. Soc., vols. 115 and 116, no. 686, Dec. 1919, pp. 1380-1387. Percentage composition of equilibrium mixtures of methane and hydrogen in contact with amorphous carbon were found to be 0.6 and 99.4 at 1100 deg. cent.; 1.1 and 98.9 at 1000 deg. cent.; and 2.5 and 97.5 at 850 deg. cent.

METHYL ACETATE

Hydrolysis of. The Rate of Hydrolysis of Methyl Acetate by Hydrochloric Acid in Water-Acetone Mixtures, George Joseph Burrows. Jl. Chem. Soc., vols. 115 and 116, no. 685, Nov. 1919, pp. 1230-1239, 1 fig. Measurement of rates of hydrolysis of methyl acetate N/2—and N/10—hydrochloric acid in various water-acetone solutions. Velocity constants are calculated according to both unimolecular and bimolecular equations, reverse reactions being considered in both cases.

METRIC SYSTEM

Arguments Against Adoption in U. S. Adoption of the Metric System Would Do Untold Damage, Henry R. Towne. Indus. Management, vol. 59, no. 6, June 1920, pp. 473-477. Abandonment of present basic standards would involve, it is claimed, damage beyond easy comprehension, injury to organized industries, injury to commerce and needless inconvenience to the people.

Committee on Technical Standards, Bureau of Surveys and Maps, Recommends Use of English Measuring System. Am. Mach., vol. 53, no. 14, Sept. 30, 1920, pp. 647-648. Stand taken by Committee in regard to question as to whether maps should be published on standard scales of metric or English measurement. It is stated that "to make a metric law compulsory would be a great misfortune to the country."

Inches versus Millimeters. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 715-719. Opinions of engineers and manufacturers in machine-building trade who are unanimously for retention of present system: What a Change of Measures Would Mean, James Hartness; The Threat of the Metric System, Henry D. Sharpe; The English versus the Metric System, C. H. Norton.

Report of the Cleveland Chamber of Commerce on the Metric System. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 283-287, 1 fig. Committee "is not able to believe that the adoption of the metric system will promote ... standards and interchangeability."

Some Effects of "Compulsory" Use of the Metric System, C. C. Stutz. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 693-694. Among effects mentioned are long transition period, introduction of dual system, confusion between two systems, cost "appalling in its magnitude," and recalculation and establishing of new prices.

Some Experience with the Metric System, Frederick A. Pope. Am. Mach., vol. 52, no. 25, June 17, 1920, pp. 1298-1299. Gives some practical objections to use of metric system of units, based on information from an actual attempt to use metric system in an American plant.

The International Chamber of Commerce did not Indorse the Metric System, Ethan Viall. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, p. 735. It is said that a resolution advising that United States and British Empire "standardize on the metric system solely" was introduced, discussed and definitely turned down.

What Real He Men Think of the Compulsory Metric System. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 415-420. Letters from manufacturers received by editor of Am. Mach. call adoption of law to make metric system compulsory "not only unwise but thoroughly impracticable," "absolutely wrong and detrimental to the interests of the American people," etc.

What the Steel Industry Thinks of the Compulsory Metric System, Ethan Viall. Am. Mach., vol. 53, no. 14, Sept. 30, 1920, p. 643. Replies received to questionnaire sent out to members of Assn. of Am. Steel Manufacturers asking them for their attitude with regard to adoption of metric system in United States. 96.3 per cent of members are against compulsory use of metric system, 0.5 per cent were neutral, 0.7 per cent were in favor and 2.5 per cent expressed no preference.

Why the Metric System Must Not be Made Compulsory, Fred A. Geier. Machy. (N. Y.), vol. 26, no. 9, May 1920, p. 819. In writer's opinion compulsory metric law would cause confusion and expense and prove great hardship to industries.

Why the Westinghouse Company Does Not Use the Metric System. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, p. 22. Metric measurements are claimed to complicate shop work because they cannot, as English, be halved and quartered without introducing complicating fractions.

Arguments in Favor of. 100,000 Petitions for Metric System. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, p. 889. It is reported that the Dept. of Commerce at Washington, D. C., has received over 100,000 petitions from all over the United States urging upon Congress the adoption of metric system of weights and measures as exclusive legal standard.

English System vs. Pan-Americanism in Weights and Measures, Frederick A. Halsey. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 784-786. Experiences of countries where Metric System has been adopted are surveyed and because "attempt to adopt the Metric Sys-

tem is a failure'' it is suggested that English system be adopted as standard by all nations of American continents.

Great Britain. Metric Committee's Report. Chem. Trade Jl. and Chem. Engr., vol. 67, no. 1738, Sept. 11, 1920, p. 351. Notice regarding report of Committee appointed by Conjoint Board of scientific societies ''to consider the proposed compulsory adoption of the metric system in the United Kingdom.'' They recommend that British system of units of weights and measures be retained. In preference to any alteration of present system they ''would recommend the whole-hearted adoption of the metric system.''

Introduction in American Factory. The Metric System in an American Factory, Theodore H. Miller. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1128-1129. How DeLaval Separator Co. changed from English to metric system. Change was effected in order to keep better in line with Swedish establishment manufacturing same machines and was made without causing confusion, or serious disturbance. It was not necessary to throw away patterns, gages or tools made to the English system.

Units, New. New Units in the Metric System—Legally Adopted in France. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, p. 152. Names adopted for units in centimeter-gram-second system. One is, for example, sthene, unit of force, which in one second of time communicates to mass equal to one ton, an increase of velocity of one meter per second. Translated from Jl. Officiel.

Use by Allies. Standardization With Metric Units, Aubrey Drury. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 409-411. Writer claims that in our dealings with Allies during war ''we were not at one'' with them because we did not use the metric system, while ''30 nations fighting Germany were all using the metric units of weights and measures, and were thus capable of complete coöperation and united action.''

MIAMI CONSERVANCY DISTRICT

Concrete for. See CONCRETE, Miami Conservancy District.

Flood Control. See FLOOD CONTROL, Miami Conservancy District.

MICA

Market in 1919. Mica in 1919, J. Volney Lewis. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 237-238. Market conditions.

MICARTA

See AEROPLANE, PROPELLERS, Bakelite-Micarta.

MICROBALANCE

Simple Arrangement. A Cheap and Simple Micro-Balance, J. H. Shaxby. Phys. Soc. of London, vol. 32, part I, Dec. 15, 1919, pp. 21-25, 5 figs. It consists of long horizontal fiber joining lower ends of two vertical beams each pivoted very little above its center mass so that small weight acting at middle of fiber causes considerable depression. This is read off by arranging slider on vertical millimeter scale about 2-ft. in front.

[See also SCALES, Micro-Balance.]

MICROMETERS

Manufacture. Making the Almond Micrometer, Ethan Viall. Am. Mach., vol. 53, no. 14, Sept. 30, 1920, pp. 605-611, 28 figs. Manufacturing methods of T. R. Almond Manufacturing Co., Ashburnham, Mass.

MICRO-ORGANISMS

Use in Industrial Chemistry. The Employment of Micro-Organisms in the Service of Industrial Chemistry, A. Chaston Chapman. Chem. News, vol. 119, no. 3109, Nov. 14, 1919, pp. 223-226. Plea for National Institute of Industrial Micro Biology. Paper read before Gen. Meeting of Soc. of Chem. Indus., Lond.

MICROPHONES

See TELEPHONY, Microphones.

MICROPHOTOMETERS

New Type. A New Microphotometer for Photographic Densities, W. F. Meggers and Paul D. Foots. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 385, June 30, 1920, pp. 299-308, 6 figs. Instrument is essentially micropyrometer described in bul. 4 of Bur. of Standards, vol. 9, 1913, p. 475, except that microscope of higher power is used.

Construction and Operation of New Microphotometer (Description et emploi d'un nouveau microphotomètre), Ch. Fabry and H. Buisson. Journal de Physique théorique et appliquée, vol. 9, no. 5, Feb. 1919, pp. 37-46, 3 figs. Designed with a view to securing uniformity of photometric plates.

MICROSCOPES

Mining Engineers'. A Reflecting Microscope for the Mining Engineer, W. Myron Davy. Min. & Metallurgy, no. 163, July 1920, pp. 30-31, 1 fig. Describes outfit designed by author, consisting of a microscope of simplest construction and weighing complete only 8 oz., the magnification obtainable being about 75 diam. (Abstract.)

MIEDZIANKIT

See EXPLOSIVES, Miedziankit.

MILITARY ENGINEERS

Work of. See ENGINEERS, Military, Work of.

MILITARY MINING

Details. Military Mining, Alfred H. Brooks. Engr. School, U. S. A., Occasional Papers, no. 62, 1920, 38 pp., 17 figs. Discusses physical conditions imposed by topography and geology, followed by details of military mining, with notes on shafts and inclines, galleries, tools and machinery, mine rescue, listening, surveying, subways, etc.

War Front. Mining Methods and Tunnelling at the Front, James A. Knight. Can. Engr., vol. 37, no. 26, Dec. 25, 1919, pp. 555-557, 5 figs. Notes on underground adventures with Second Canadian Tunnelling Company. Description of defense of Mt. Sorrel; construction of galleries and dugouts; experiences at listening posts, etc.

MILITARY ROADS

See ROADS, Military.

MILLING

Continuous vs. Station. Continuous Versus Station Milling, George M. Meyncke. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 151-153, 4 figs. Comparison of results that are obtained by both methods of milling on identical work when using similar machines in interchangeable manufacture.

Duplicate-Part Work. Production Milling on Automatic Machines, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 247-251, 12 figs. Practice in milling of duplicate parts. Third article.

Elliptical Shapes. Fixture for Milling an Ellipse, P. A. Fredericks. Am. Mach., vol. 53, no. 17,

Oct. 21, 1920, pp. 752-754, 4 figs. Fixture devised for milling small elliptical shapes on production basis.

Indexing Fixtures. Indexing Milling Fixtures. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 721-724, 7 figs. Notes on vertical feed milling attachment, hobbing worm-wheels on a milling machine, roughing out teeth of bevel-gear blanks, milling grooves in steel forgings, and fluting hollow milling cutters.

Power Consumed in. Power Consumed in Milling, Fred A. Parsons. Am. Mach., vol. 53, no. 7, Aug. 12, 1920, pp. 315-316, 1 fig. Investigation of variables affecting power consumed in milling was undertaken for purpose of constructing slide rule which would indicate for various cuts power required, and therefore, machine best adapted for job. Data were obtained in tests made by Kempsmith Manufacturing Co. on various Kempsmith millers.

String-Milling Fixtures. String Milling Fixtures, Edward K. Hammond. Machy. (N. Y.), vol. 26, nos. 4 and 5, Dec. 1919 and Jan. 1920, pp. 337-341, 9 figs., and 443-447, 11 figs. Discussion of typical examples of design and results obtained in operating fixtures.

MILLING CUTTERS

Cast Alloy Steel. Chrobaltic Cast Milling Cutters, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 354-358, 9 figs. Methods used in casting milling cutters from chromium cobalt alloy steel.

Drop Forgings for. High Speed Steel Drop Forgings for Milling Cutters and Special Tools, A. F. MacFarland. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, March 1920, pp. 279-287, 17 figs. Advantages claimed are more homogeneous structure, lower machine cost, lower scrap losses, time saved in making tool, elimination of physical defects, and increased production obtained per tool.

Form-Relieved. Form Relieved Milling Cutters, I. H. Wright. Machy. (Lond.), vol. 16, no. 395, Apr. 22, 1920, pp. 61-70, 11 figs. Notes on governing principles of correct design and their application to tool-room work. Machine hint to operators.

Screw-Thread, Tests of. The Cutting Pressure, Cutting Speed, Feed and Durability of High-Speed-Tool-Steel Thread-Milling Cutters (Schnittdruck, Schnittgeschwindigkeit, Vorschub und Lebensdauer bei Gesindefräsern aus Schnellstahl), Hermann Ederheimer. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 7, Feb. 14, 1920, pp. 149-153, 15 figs. Translation in Eng. & Indus. Management, vol. 3, no. 10, Mar. 4, 1920, pp. 309-311, 5 figs. By means of experiments described, writer has determined for thread-milling cutters of 38.5, 48 and 53.5 mm. diam., influence of cutting speed and feed on number of cuts up to first grinding and on total life of cutters, as well as the dependence of life of cutter on cutting pressure.

Shaft Splining. Milling Cutter for Splined Transmission Shaft, W. Richards. Machy. (Lond.), vol. 15, no. 372, Nov. 13, 1919, pp. 218-221, 9 figs. How to make milling cutter to cut within close limits 4 splines in transmission shaft.

MILLING MACHINES

Automatic. The Brown and Sharpe No. 21 Automatic Milling Machine, E. L. Dunn. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 649-652, 7 figs. Milling machine was designed for production of duplicate parts on quantity basis.

Bracings for. Recent Machine Tool Developments, Joseph Horner. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 236-239, 32 figs. Details of bracings for pillar and knee machines, Lincoln machine braces, gear-cutter bracings and shapers.

Cincinnati. The Cincinnati M-Type Milling Machine, John H. Van Deventer. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 749-753, 12 figs. Made in two sizes and in three forms—plain, universal and vertical—all of constant-speed type.

Continuous. Continuous Milling Machine. Can. Machy., vol. 24, no. 15, Oct. 7, 1920, pp. 336-339, 8 figs. Machines manufactured by Newton Machine Tool Works, Inc., Philadelphia.

Continuous Milling Machine with Fixed Production. Automotive Industries, vol. 43, no. 14, Sept. 30, 1920, pp. 664-665, 5 figs. Machine equipped with revolving work table, which is adjustable on base, in order that work may be placed upon smallest possible radius and cutter of smallest possible diameter utilized.

Ingersoll Circular-Table Continuous Milling Machines, J. V. Hunter. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 915-918, 6 figs. Types of continuous milling machines designed for maximum production with minimum labor.

Ingersoll Continuous Milling Machines. Eng., vol. 110, no. 2850, Aug. 13, 1920, pp. 222-224, 12 figs. Constructed by Ingersoll Milling Machine Co., Rockford, Ill. In one type pieces of work are mounted on horizontal revolving drum which in its rotation carries work past revolving, roughing, and finishing inserted-tooth cutters.

The Ingersoll Differential-Type Continuous Milling Machine, J. V. Hunter. Am. Mach., vol. 51, no. 14, Oct. 2, 1919, pp. 645-650, 7 figs. Outstanding features are said to be: (1) Large capacity on relatively large pieces of work in connection with minimum amount of floor space; (2) small amount of labor required, only one operator being required; and (3) fact that it carries large number of milling cutters, each of which may be arranged for simultaneous operation of different pieces of work.

Crankshaft. Designs New Miller for Crankshafts. Iron Trade Rev., vol. 66, no. 10, Mar. 4, 1920, p. 713, 2 figs. Machine carries two motor-driven, inserted-tooth cutters that mill both sides of crank simultaneously. It is manufactured by Newton Machine Tool Works, Inc., Philadelphia.

Stamets Crankshaft Milling Machine, Ethan Viall. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 245-248, 7 figs. Construction and operation of machines for quantity milling of odd-shaped crankshaft.

Cutter and Arbor Driving. The Construction of Spindle Ends for Millers, Fred Horner. Can. Machy., vol. 24, no. 8, Aug. 19, 1920, pp. 173-177, 20 figs. Practice of cutter and arbor driving on milling machines, as adopted by various concerns.

Grinding Attachment. A Grinding Attachment for a Milling Machine, Jack Finlay. Am. Mach., vol. 53, no. 3, July 15, 1920, pp. 114-116, 3 figs. Device for grinding holes in pieces that are too long to swing in universal grinder or lathe, or so unwieldy that time required for setting up is long in comparison with that taken for grinding.

High-Power. The New Cincinnati No. 4 High-Power Milling Machines. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 623-624, 3 figs. Description of machines made in both plain and universal types, which are said to be identical in design with new no. 5 described on p. 971, vol. 50.

Ingersoll. Application of New Ingersoll Milling Machines. Machy. (N. Y.), vol. 26, no. 9,

May 1920, pp. 810-816, 19 figs. These machines are equipped with two or more work-holding fixtures so that a machine is milling a casting held in one fixture while operator is setting up work in another, thus preventing idle machine time.

See also Continuous.

Jigs for Constructing. See JIGS, Milling-Machine Construction.

Multiple-Spindle. Special Multiple-Spindle Milling Machines. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 856-862, 15 figs. For milling naval gun mountings.

Planer Type. A Large Milling Machine of Recent Construction and Its Electric Equipment (Ein neuzeitliches grosses Fräswerk und seine elektrischen Einrichtungen), H. Weil. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 46, Nov. 15, 1919, pp. 1141-1145, 8 figs. Description and illustrations of the Schiess planer type machine with three double spindles and operated with seven electric motors, which are described in detail.

Railway-Shop. Garvin No. 3 Duplex Slot-Milling Machine, C. J. Priebe. Am. Mach., vol. 53, no. 5, July 29, 1920, pp. 202-204, 3 figs. Machine said to be specially adapted to slotting of crossheads and piston rods for taper keys.

Rockford. Rockford Number Three Milling Machine, J. V. Hunter. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 377-379, 5 figs. Features of machine are rectangular overarm, saddle support and reinforced base for elevating screw.

Schiess (German). See Planer Type.

Spindle Noses. Standard Spindle Noses for Milling Machines. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 548-549, 17 figs. Types in use by various members of Associated British Machine Tool Makers, Ltd., are presented and it is suggested in reference to previous article on subject published in Engineering that whole question of standardization be thrashed out with a view to securing interchangeability of arbors. Also in Engr., vol. 128, no. 3328, Oct. 10, 1919, p. 358, 4 figs.

Spline, Two-Spindle. Two-Spindle Spline Milling Machine. Can. Machy., vol. 23, no. 9, Feb. 26, 1920, pp. 228-229, 4 figs. Description and illustrations of machine recently placed on market by Taylor & Fenn Co., Hartford, Conn.

Square-Thread. The Zadow Square-Thread Milling Apparatus (Flachgewindefräsapparat System "Zadow"). Der praktische Maschinen-Konstrukteur, vol. 53, no. 16, Apr. 22, 1920, pp. 63-64, 2 figs. Describes apparatus which works automatically and can be attached to a screw-cutting lathe in 10 to 15 min.

Thread. British Thread Milling Machines. Engineer, vol. 128, no. 3326 and 3327, Sept. 26 and Oct. 3, 1919, pp. 302-304 and 324-326, 12 figs. Machine in which cutter and work are always driven at same speed, thread is not milled to full depth until after work has made 30 to 40 revolutions and work and cutter do not move longitudinally relatively to each other.

Gray Thread Milling Machines. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 875-876, 2 figs. Description of new line of thread millers developed by the Gray Machine Tool Co., Inc., Buffalo, N. Y., which, it is said, will handle bar work, work held in a chuck, or work held between centers.

The Trundle Automatic Thread Milling Machine, Fred H. Colvin. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 813-816, 7 figs. Machine is said to be commercialized development of special machine designed before entrance of this country into war for purpose of catching up with production schedule on foreign munition contracts. Article explains how it has been redesigned for general manufacturing purposes.

Toledo Vertical. Toledo Vertical Milling Machine. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 363-364. Attention is called to design and weight of main column of miller. It is machined from casting weighing 1½ tons, metal being so proportioned as to give greater resistance against strain.

Universal. Universal Milling and Shaping Machine for Precision Work. Eng., vol. 109, no. 2841, June 11, 1920, pp. 784-786, 9 figs. Machine is capable of shaping, slotting, drilling, dividing and cutting gears.

MINE CARS

See CARS, Mine.

MINE HAULAGE

Acceleration, Measurement of. Measurement of Acceleration of Haulage Plants (Zur Messung der Beschleunigung auf Förderanlagen), E. Jahnke and G. Keinath. Dingler's polytechnisches Jl., vol. 305, no. 11, May 29, 1920, pp. 119-125, 16 figs. Results of experiments carried out in haulage plants of a number of mines with a described registering acceleration meter constructed by Siemens & Halske.

Electric. Notes on Electric Mine Haulage (Beiträge zum Antrieb elektrischer Fördermaschinen), H. Baclesse. Elektrotechnische Rundschau, vol. 36, nos. 27-28, 29-30 and 31-32, July 9, July 23, and Aug. 6, 1919, pp. 97-99, 105-107 and 114-115, 3 figs. Comparisons are made, with aid of traction diagram, between direct drive with 3-phase motor with or without shafting, and Ward Leonard system of drive with or without flywheel.

Rope-Haulage Methods and Equipment That Have Given Success at Lethbridge, Alta, J. B. DeHart and J. H. Turner. Coal Age, vol. 17, no. 22, May 27, 1920, pp. 1081-1084, 21 figs. Details of three motor-driven haulages, using ¾-in. Lang lay crucible cast-steel haulage ropes.

Ilgner Regulating System. New Flywheel Equalizers in Electric Haulage Plants (Neuere Schwungradpufferungen in elektrischen Förderanlagen), W. Wolf. Kali, vol. 13, no. 21, Nov. 1, 1919, pp. 353-356, 4 figs. Describes haulage plant with improved Ilgner flywheel regulation for winding motor, at Siemens-Schuckert Works, Ltd., near Berlin.

[See also COAL MINES, Haulage Inclines; MINE LOCOMOTIVES.]

MINE HOISTING

Bucket Elevator for. Hoisting by Means of Bucket Elevator at the Lignite Mines of the A. Riebeck Works, Inc. [Schachtförderung mittels Becherwerks auf der Braunkohlengrube Gottlob (bei Theissen) der A. Riebeckschen Montanwerke, A.-G.], Ottomar Aockerblom. Braunkohle, vol. 18, no. 49, Mar. 6, 1920, pp. 647-653, 2 figs. Details of construction, operation and cost of installing.

Cable Installation. Installation of a Shaft Cable at Kirkby Colliery, Joseph Bircumshaw. Iron & Coal Trades Rev., vol. 100, no. 2714, March 5, 1920, pp. 313-314, 4 figs. Method of installing three-core 0.25 sq. in. in area, fiber-insulated, bitumen-sheathed, double-wire armored cable of 420 yd. in length and eight tons in weight.

Coal Mines. Mine Hoisting Duty Cycles in Operation, M. A. Whiting. Coal Industry, vol. 3, no. 6, June 1920, pp. 272-277, 7 figs. Certain specific hoisting conditions in practical operation at coal mine are given as example, and results obtained in actual practice are graphically illustrated and described.

New Electrically-Driven Hoisting Equipment at Kilton Collieries, M. Meredith. Coal Age, vol. 17, no. 13, March 25, 1920, pp. 596-597, 2 figs. Features of cylindro-conical drum hoist, driven through flexible coupling and back gears by alternating-current motor and giving rope speed of 1300 ft.

Susquehanna Collieries Co.'s Improvements Near Shamokin, Pa. Coal Age, vol. 17, no. 16, Apr. 15, 1920, pp. 756-757, 3 figs. Coal will be discharged underground by rotary pump and hoisted by skip.

Electric. Typical Installations of Electric Mine Hoisting in South Africa, E. B. Hell. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 775-782, 7 figs. Description of mines, shafts, hoists, electrical equipment, and control devices of latest and largest installations of electric mine hoists both of direct-current motor and induction motor types.

Electric Controllers for. Electric Controllers for Mine Hoists, W. C. Goodwin. Elec. Jl., vol. 17, no. 3, Mar. 1920, pp. 119-122, 6 figs. Typical installation of high-voltage electric motor mine hoist.

Winding Ropes. The Safety Factor of Winding Ropes, O. Speer. Colliery Guardian, vol. 120, no. 3114, Sept. 3, 1920, p. 657. German regulations. Translated from Glückauf.

Winding Ropes and Bending Stresses, O. Speer. Colliery Guardian, vol. 119, no. 3085, Feb. 13, 1920, p. 449, 7 figs. Writer holds that spirally twisted wires in rope are more flexible than same wire straightened out. Deductions from winding rope statistics of the Dortmund district. (Translated from Glückauf.)

[See also CABLES, HOISTING; HOISTS, Mine.]

MINE HOISTS

See HOISTS, Mine.

MINE LOCOMOTIVES

Combination Storage Battery and Trolley. How to Operate Combination Storage Battery and Trolley Locomotives, John B. Hicks. Coal Age, vol. 18, no. 2, July 8, 1920, pp. 59-62, 4 figs. Practical instructions for motormen, repairmen, superintendents and foremen, intended to enable them to keep their equipment continuously in running order. Use of constant current and constant potential in charging. From paper read before Kentucky Min. Inst.

Development. Developments in Locomotive Construction, H. H. Johnston. Coal Industry, vol. 3, no. 9, Sept. 1920, pp. 428-431, 3 figs. Improvement in control, contractors and contractor compartments, reversers, overload protection, grid resistors, headlights and gears.

Electric. A New Type of Gathering Locomotive, John Liston. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 446-450, 8 figs. Electric locomotive equipped with electric braking controller.

Changes that Experience has Dictated in Details of Combination Locomotives, John B. Hicks. Coal Age, vol. 18, no. 1, July 1, 1920, pp. 20-22. Devices were introduced in combination trolley and storage battery locomotives at mine of Consolidated Coal Co., Jenkins, Ky., to prevent excessive rate of charge during gassing stage, to make impossible a too complete discharge of batteries and to avoid possibility of discharging batteries into trolley circuits.

Miniature Mine Locomotive, Weighing Under a Ton, Gathers Coal from Low Places, Donald J. Baker. Coal Age, vol. 18, no. 11, Sept. 9, 1920, pp. 535-536, 2 figs. Locomotive weighs 1800 lb., is about 26 in. high and exerts tractive effort of 800 lb.

See also Storage-Battery; ELECTRIC LOCOMOTIVES, Storage-Battery.

Flooded, Drying Out. How Electrical Apparatus Was Restored after Being Deeply Submerged, E. J. Gealy. Coal Age, vol. 18, no. 11, Sept. 9, 1920, pp. 540-541, 1 fig. Mine flood covered locomotives of Sayre Colliery under head of about 30 ft. Apparatus thus drowned was dried in temporary oven and put back into service, saving both time and money.

Gasoline. Operation of Gasoline Locomotives in Coal Mines (Essais de traction par locomotives a benzine), M. Dessemond. Bul. et Comptes rendus mensuels de la Société de l'Industrie Minérale, vol. 17, no. 2, March-April 1920, pp. 145-150. Tests made at Saint-Etienne collieries with a view to determine quantity of air required to be circulated through mine and cost of operating such locomotives.

Gathering Engine. Gathering Locomotive with New Features to Lengthen Life and Save Power, John Liston. Coal Age, vol. 17, no. 19, May 6, 1920, pp. 895-898, 6 figs. Features described are electric braking, outside frame with high track clearance, leaf-type springs, improved cable reel and demountable tires.

Storage-Battery. Care of Storage-Battery Locomotives, Humphrey D. Smith. Coal Age, vol. 17, no. 6, Feb. 5, 1920, pp. 264-268, 1 fig. Suggestions are given, such as not permitting temperature to rise too high or to let the input of electric energy be too rapid in order to prevent excessive gassing, avoiding overloading, using only distilled water for filling up cells, etc.

Procedure for Establishing a List of Permissible Storage-Battery Locomotives for Use in Gaseous Mines. Dept. Interior, Bureau of Mines, schedule 15, Nov. 1919, 10 pp. Character of tests, conditions under which storage-battery locomotives will be tested, and fees.

Storage-Battery Locomotives as Main Haulage Motors, J. Shanks. Can. Min. Inst. Bull., no. 96, Apr. 1920, pp. 299-308, 4 figs. Operating records show that these locomotives are absolutely safe, but it is recommended that in gaseous mines they should be confined to operation in intake air and should not be allowed nearer a working face than about 300 ft.

See also ELECTRIC LOCOMOTIVES, Storage-Battery.

Storage-Battery vs. Trolley. Selecting Electric Haulage Equipment, R. H. Bacon. Elec. World, vol. 75, no. 15, Apr. 10, 1920, pp. 831-833, 3 figs. Comparative operating records of trolley and storage-battery locomotives in copper mines of Lake Superior district.

See also Combination Storage-Battery and Trolley.

MINE-RESCUE APPARATUS

Accidents in Use of. Accidents in the Use of Rescue Apparatus, D. Dale Logan. Colliery Guardian, vol. 117, no. 3051, June 20, 1919, pp. 1489-1490, 1 fig. Accidents due to structural defect of rescue apparatus or injury of apparatus. Used and possibilities of Proto apparatus. Paper read before Instn. Min. Engrs.

Breathing Apparatus. Breathing Apparatus and Regeneration of Air (Les apparells respiratoire à régénération de l'air). Génie Civil, vol. 75, no. 26, Dec. 27, 1919, pp. 652-655, 2 figs. Results obtained with scaphandre invented by A. & L. Boutan. (See Génie Civil, Jan. 23, 1915.)

Effective Use of Breathing Apparatus, J. T. Ryan. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 502-504. Suggestions in regard to manner of using self-contained breathing apparatus in fighting or isolating mine fires. Pa-

per read before Min. Section of National Safety Congress.

Research. Mine Rescue Apparatus. Iron & Coal Trades Rev., vol. 101, nos. 2735 and 2736, July 30 and Aug. 6, 1920, pp. 129-131 and 161-164, 15 figs. Report issued by Mine Rescue Apparatus Research Committee appointed by Advisory Council for Scientific and Industrial Research, England. Account is given of experimental results obtained in Edinburgh during last two years, and new or improved methods and apparatus which are outcome of such investigation are described.

The Mine Rescue Apparatus Research Committee. Colliery Guardian, vol. 120, nos. 3109, 3110, 3111 and 3112, July 30, Aug. 6, 13 and 20, 1920, pp. 312-314, 379-381, 449-450 and 522-524, 17 figs. Experimental results obtained in Edinburgh during last two years, and description of new or improved methods and apparatus which are outcome of investigation. Warning against use of certain appliances for mining purposes. Construction, operation and record of tests of Briggs compressed oxygen mine-rescue apparatus.

Self-Contained. Observations on the Use of Self-Contained Breathing Apparatus, G. L. Brown. Iron & Coal Trades Rev., vol. 99, no. 2702, Dec. 12, 1919, pp. 766-767. Working capacity, cost and dangers.

Recent Development in Mine-Rescue Apparatus in the United States, F. F. Morris. Coal Age, vol. 16, no. 16, Oct. 16, 1919, pp. 649-650, 2 figs. Particularly self-contained breathing apparatus.

Systems. Mine Rescue Apparatus (Gastauchapparate), H. Schoeneich. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 7, Sept. 1919, pp. 215-229, 7 figs. Gives details and illustrations of various systems and points out advantages and disadvantages. Account of gas masks used during the war.

[See also COAL MINES, Rescue Apparatus.]

MINE RESCUE WORK

Aeroplanes in. Use of Airplanes in Mine Rescue Work, F. J. Bailey. Monthly Reports of Investigations, Bur. of Mines, Dept. of Interior, April 1920, 3 pp. Preliminary survey of Bur. of Mines has indicated "that airplane service might be effectively utilized in the flat-lying coal-fields of Illinois and Indiana."

Rescue Car. Nova Scotia Co.'s Rescue Car: First Firm in America to Use Breathing Apparatus, Frank H. Kneeland. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 728-730. 3 figs. Car for fourteen men, heated by electricity or steam, carries five sets of apparatus, maps of mines and of water lines, and first-aid room.

Stations, England. The Chesterfield Central Mine Rescue and Fire Station. Colliery Guardian, vol. 118, no. 3086, Feb. 20, 1920, pp. 585-588, 14 figs. Structural details of three central rescue and fire stations in Nottinghamshire and Derbyshire coal field.

MINE SWEEPING

Wartime Development. Mine-Sweepers. Times Eng. Supp., no. 542, Dec. 1919, p. 360. Wartime development.

MINE TIMBERING

Failure. Failure of Mine Timbers, George J. Young. Eng. & Min. Jl., vol. 109, no. 10, March 6, 1920, pp. 611-612, 2 figs. Influence of ventilation and high temperatures in reducing strength of timbers.

Methods. Timbering in Mines, Gomer Edwards. Iron & Coal Trades Rev., vol. 101, no. 2735, July 30, 1920, pp. 134-136, 32 figs. Comparative study of timbering methods. Writer declares himself in favor of timber at faces, combination of timber and masonry or timber and iron on branch roads, and masonry only or masonry and metal on main roads and pit bottom.

Old Steel Rails. The Conservation and Drawing of Mine Timber, P. T. Prendergast. Can. Min. Jl., vol. 41, no. 19, May 14, 1920, pp. 389-392. Writer claims it has been proved conclusively that main roads can be supported as cheaply by using steel rails that have been condemned for railway use, as with round spruce timber, and life of steel boom as compared with spruce might well be placed at 20 to 1. Paper read before Min. Soc. of Nova Scotia.

Protection of. Use of Magnesia Cement as a Protection for Timbers, W. C. Phalen. Eng. World, vol. 16, no. 5, Mar. 1920, p. 273. Importance of protecting timber for mining purposes in localities where timber is scarce is pointed out. Methods of applying magnesia cement stucco, which is said to adhere to all materials in marked degree, are explained.

MINE WORKERS

Health of. See MINING INDUSTRY, Health of Workers.

MINERAL OILS

Production of. The Production of Oil from Mineral Sources, J. Mollwo Perkin. Jl. Instn. Petroleum Technologists, vol. 5, no. 18, Feb. 1919, pp. 75-93 and (discussion) pp. 93-105. Noting distinction between high- and low-temperature processes of carbonizing bituminous material.

Specific Heats. The Determination of the Specific Heat of Heavy Mineral Oils, Herbert S. Bailey and Carlton B. Edwards. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 891-894, 1 fig. Method is outlined which is believed to be especially adaptable to plant control work and to laboratory investigations where rapid work and fair degree of accuracy are required.

Testing. Laboratory Tests on Mineral Oils. Chem. Age, vol. 1, no. 20, Nov. 1, 1919, pp. 516-517. Proposals for standardization. Paper read before Instn. Petroleum Technologists.

Some Laboratory Tests on Mineral Oils, Arnold Philip. Jl. Instn. Petroleum Technologists, vol. 6, no. 21, Jan. 1920, pp. 5-61 and (discussion) pp. 61-81, 4 figs. Suggestions in regard to preparation of samples and in regard to methods of testing oils. Relative values of tests in use are discussed and apparatus used by writer for topping of crude oils is described.

MINERAL RESOURCES

Southern U. S. Some Developed Mineral Resources and Chemical Industries of the Southern States, Andrew M. Fairlie. Chem. & Metallurgical Eng., vol. 22, no. 7, Feb. 18, 1920, pp. 307-312, 5 figs. Phosphate rock, mining, grinding, acidifying and mixing into commercial fertilizer; mining of sulphur, pyrites and pyrrhotite; manufacture of sulphuric acid; smelting of copper.

MINERALS

Blow-Pipe Analysis. New Rapid Process for Analyzing Condensed Vapors of Metals and Metalloids Volatilized in the Blowpipe (Nouveau procédé simple et rapide permettant, de recueillir et de caractériser les enduits produits par les métalloides et les métaux susceptibles de se volatiliser au chalumeau), Ad. Braly. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 11, March 15, 1920, pp. 661-663. It is suggested to separate condensations by fractionation at suitable intervals of tempera-

ture. This, it is claimed, will permit analysis of elements in mineral, since all do not vaporize at same temperature.

Deposits, Idaho. Tungsten, Cinnabar, Manganese, Molybdenum, and Tin Deposits of Idaho, D. C. Livingston and Francis A. Thomson. Bul. University of Idaho School of Mines, vol. 14, no. 2, Jan. 1919, 72 pp., 11 figs. With notes on the antimony deposits.

Flotation. See FLOTATION, Processes and Applications.

Inyoite. See INYOITE.

Jugoslavia. Mineral Wealth of the Kingdom of Jugoslavia, Gordon Gordon-Smith. Eng. & Min. Jl., vol. 110, no. 15, Oct. 9, 1920, pp. 705-712, 3 figs. Region is rich in base metals and has gold, silver and coal. Mineral deposits are described.

Microscopic Study of. The Application of Metallographic Methods to Microscopic Investigations of Mineral Deposits—III (Zur Anwendung metallographischer Methoden auf die mikroskopische Untersuchung von Erzlagerstätten), Bartel Granigg. Metall u. Erz, vol. 17, no. 3, Feb. 8, 1920, pp. 57-61, 8 figs. Results of investigations of titaniferous magnetite occurring in Smalands Taberg, Sweden, as well as of a number of ilmenites from different localities.

Names of (List). Eighth List of New Mineral Names, L. J. Spencer. Mineralogical Mag., vol. 18, no. 87, Nov. 1919, pp. 373-390. Compiled from reports of scientific publications throughout the world; principal particulars of 106 minerals are given.

New Type. A New Mineral, Isomorphous with Trechmannite, from the Binn Valley, Switzerland, R. H. Solly. Mineralogical Mag., vol. 18, no. 87, Nov. 1919, pp. 363-365. Description of specimen in which there were three small round-shaped crystals, about the size of small shot, grown upon a prismatic crystal of sartorite.

Production in U. S. Cobalt, Molybdenum, Nickel, Titanium, Tungsten, Radium, Uranium, and Vanadium in 1917, Frank L. Hess. Dept. of Interior, U. S. Geological Survey, Mineral Resources of U. S.—Part I, Aug. 31, 1920, pp. 899-959. Notes on production and uses of each one of these minerals with statistics as to imports and exports.

Rare-Earth. Thorium, Zirconium and Rare-Earth Minerals in 1919, Waldemar T. Schaller. Dept. of Interior, U. S. Geological Survey, Mineral Resources of U. S.—Part II, Sept. 1, 1920, 32 pp. Statistics of production.

Villamanite. Villamanite, a New Mineral, W. R. Schoeller and A. R. Powell. Mineralogical Mag., vol. 19, no. 88, March 1920, pp. 14-18. Sulphide of copper, nickel, cobalt and iron rich in selenium, found near Villamin, Province of Leon, Spain.

Vonsenite. Vonsenite. A Preliminary Note on a New Mineral, Arthur S. Eakle. Am. Mineralogist, vol. 5, no. 8, Aug. 1920, pp. 141-143. Specimens of coal-black, lustrous mineral collected at Riverside, Cal., by M. Vonsen.

[See also POTASH, Deposits, Texas; also names of minerals.]

MINERS' LAMPS

Acetylene. The Wolf-Pokorny and Wiede Acetylene Safety Lamps, William Maurice. Trans. Instn. Min. Engrs., vol. 59, part 4, Aug. 1920, pp. 322-329 and (discussion) pp. 329-333, 9 figs.; also Colliery Guardian, vol. 119, no. 3102, June 11, 1920, pp. 1646-1647, 6 figs. Wolf-Pokorny lamp consists of carbide container, water vessel and lamp frame. Wiede lamp is constructed on Wolf-Pokorny system described and its special characteristics are (1) air admission to flame from below only, (2) provision of novel cooling device, and (3) application of an inverted gauze secured in a solid metal cylinder.

Electric. Recent Improvements in Miners' Electric Lamps, Wm. Maurice. Colliery Guardian, vol. 119, no. 3082, Jan. 23, 1920, pp. 239-241. Deals specially with developments in mechanical and electrical design of lamps and introduction of new types of storage batteries. Paper read before Manchester Geol. and Min. Soc.

The "Oldham" Patent Cap Type Miners' Electric Safety-Lamp, George Oldham. Trans. of Instn. Min. Engrs., vol. 59, part 4, Aug. 1920, pp. 334-337 and (discussion), pp. 337-348, 3 figs. Storage battery is carried on belt and lamp attached to cap.

Gas Temperatures. Safety Lamp Gauzes, T. J. Thomas. Colliery Guardian, vol. 118, no. 3071, Nov. 7, 1919, pp. 1241-1242. Tables showing average temperatures of safety lamp gases in high-velocity explosive currents.

Research. Miners' Lamps Committee. Iron & Coal Trades Rev., vol. 101, no. 2742, Sept. 17, 1920, pp. 365-368, 9 figs. Committee was appointed by British Home Secretary to inquire and report what improvements were possible in miners' lamps as regards safety and illumination and what alterations were desirable in present methods of testing and approving such lamps. Article gives report issued by research sub-committee on passage of flame of an explosion through wire gauze.

Singing-Flame Firedamp. The Fleissner Singing-Flame Lamp, William Maurice. Trans. of Instn. of Min. Engrs., vol. 59, part 4, Aug. 1920, pp. 311-321, 8 figs. Pitch of sound given by singing flame is increased when firedamp enters into tube. Record of experiments and description of lamp.

MINERS' NYSTAGMUS

See HEALTH, Miners' Nystagmus.

MINES

Accidents in. Accidents on Haulage Inclines, V. Eateyne and L. Lebens. Colliery Guardian, vol. 118, no. 3070, Oct. 31, 1919, p. 1165, 7 figs.; also Quarry, vol. 24, no. 274, Dec. 1919, pp. 319-322, 7 figs. Recommendations for lessening possibilities of accidents, based on investigation of causes of such accidents in Belgian mines during period 1889-1912. Translated from Annales des Mines de Belgique.

Causes of Accidents on Incline Planes of Mines and Manner of Preventing Them (Les causes d'accidents sur les plans inclinés des mines et l'étude des dispositions à prendre pour les prévenir). Génie Civil, vol. 75, no. 17, Oct. 25, 1919, pp. 395-398, 23 figs. Investigation and studies made by Belgium Department of Mines. Abstracted from Annales des Mines de Belgique, vols. 19 and 20.

English Language and Mine Accidents, Albert H. Fay. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 489-492. Showing by comparison accidents increase as failure to speak a common language decreases.

Mining Laws and Economics, David Bowen. Colliery Guardian, vol. 118, no. 3077, Dec. 10, 1919, pp. 1642-1643. Court decisions defining employer's liability in mine accidents.

Bunker Hill Enterprise. The Bunker Hill Enterprise, T. A. Rickard. Min. and Sci. Press, vol. 121, no. 12, Sept. 18, 1920, pp. 413-418, 3 figs. Labor troubles and how they were overcome.

China. Mineral Enterprise in China, Thomas T. Read. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14, 1920, pp. 298-301, 4 figs. Difficulties foreign operator must contend with. It is said

that there are small possibilities of discovering extensive ore deposits, and that development of properties is hindered by lack of transportation facilities.

Drainage with Air Lift. Air Lift for Mine Drainage, S. F. Shaw. Eng. & Min. Jl., vol. 109, no. 23, June 5, 1920, pp. 1263-1268, 9 figs. Practical data and detailed description of installation in Mexico. Theoretical quantity of air required by lift. Details of footpiece, discharge box, and measuring weir.

Fire Prevention. Subterranean Fires (Étude sur les feux souterrains), M. Frantzen. Annales des Mines, vol. 8, no. 3, 1919, pp. 5-140, 28 figs. Survey of systems for protection against fire, employed in various mines of France, Germany and Austria.

Fire Protection. The Theory and Practice of Fighting Mine Fires from Practical Experience Gained in Pictou County, F. E. Notebaert. Can. Min. Jl., vol. 41, no. 19, May 14, 1920, pp. 393-397. Paper read before Min. Soc. of Nova Scotia.

Fires. See BREATHING APPARATUS.

France, Nationalization in. French Law on the Nationalization of Mines. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 129-132. On Sept. 9, 1919, President of French Republic signed law which limits period for which mining concessions will henceforth run, and provides for participation of State and of workers in profits. Translation of text of law is given.

Haulage. See MINE HAULAGE.

Hoisting. See MINE HOISTING.

Lighting and Eyesight. Lighting Conditions in Mines, with Special Reference to the Eyesight of Miners, T. Lister Llewellyn. Illuminating Engr., vol. 13, no. 3, March 1920, pp. 67-79 and (discussion), pp. 80-102, 9 figs. It is said that nystagmus is common in all safety lamp pits and rare in candle pits. Standard of illumination based on this fact is suggested of one-tenth of a foot-candle over whole working area.

The Influence of Conditions of Illumination Upon the Eyesight of Workers in Coal and Metalliferous Mines. Illuminating Engr., vol. 13, no. 3, March 1920, pp. 103-106. Examinations of miners at metal and coal mines in Belgium have disclosed the fact that workers operating by inadequate illumination from safety lamps showed notable proportion (more than 10 per cent) of cases of nystagmus, whereas workers in same category receiving light for more than one year from incandescent electric lamps (32 candlepower) showed no signs of nystagmus.

Ore Sampling. See ORE SAMPLING, Mines.

Reinforced-Concrete, Use in. The Applications of Ferro-Concrete in Mines, T. J. Guéritte. Trans. Instn. Min. Engrs., vol. 58, part 3, Feb. 1920, pp. 184-205 and (discussion) pp. 205-211, 43 figs. Details of reinforced-concrete headstead, pithead frames, coal bunkers and coal-wagon reservoir.

Rescue. Standardizing Mine Rescue. Salt Lake Min. Rev., vol. 21, no. 15, Nov. 15, 1919, pp. 29-30. Its desirability. Address delivered at Eighth Annual Safety Congress.

Rescue Apparatus. The Depolarisation by Oxygen of a Voltaic Cell, A. M. Williams. Jl. Soc. Chem. Industry, vol. 39, no. 16, Aug. 31, 1920, pp. 285T-286T. Experiments undertaken with a view to obtain indicator automatically recording oxygen percentage in air of mine rescue apparatus and oxygen chambers. Underlying idea was that polarization in voltaic cell due to film of hydrogen on positive pole might be removed by stream of oxygen, and it was sought to establish relation between amount of depolarization and percentage of oxygen in current of gas passing over positive plate.

Safety in. Use of Stenches as a Warning in Mines, S. H. Katz, V. C. Allison and W. L. Egy. Dept. of Interior, Bur. of Mines, technical paper 244, 1920, 31 pp., 5 figs. Opinion is stated that placing of stenches in compressed-air lines of mine to warn miners of danger offers certain advantages over use of electric bells or other means of warning. Of 24 chemicals examined, butyl mercaptan, ethyl mercaptan, amyl acetate, butyric acid and valeric acid were found most promising for mine warnings.

Safety Standards. Mine Safety Standards. Bur. of Mines, State of Colorado, bul. no. 9, June 1, 1920, 20 pp. Standards are provided for surface and shaft hazards, underground haulage, falls of rock, falls of person, explosives and electricity.

Salting, Detection of. The Detection of Salting, Morton Webber. Min. & Sci. Press, vol. 119, no. 19, Nov. 8, 1919, pp. 673-676. Suggested for detecting fraud.

Sampling, Combination Method of. The Combination Method of Mine-Sampling, Morton Webber. Min. & Sci. Press, vol. 120, no. 9, Feb. 28, 1920, pp. 303-306, 1 fig. Writer claims latent errors in sampling can be detected only by actually treating ore. "Combination" method is described as consisting in large number of small mill-tests spread over ore deposit; these serve to correct hand-sampling of spaces intervening between mill-tests by a factor obtained by successive sampling of the faces of the small stopes as ore was removed with recovery plus tailing loss.

Shaft Houses. Building Reinforced-Concrete Shaft Houses, J. Ellzey Hayden and Lucien Eaton. Min. & Metallurgy, no. 164, Aug. 1920, pp. 25-26, 2 figs. Plan adopted at Cliffs shaft mine of Cleveland Cliffs Iron Co., Ishpeming, Mich., calling for reinforced-concrete building 33 ft. square inside at ground level, with solid vertical walls for 31 ft., then tapering to 21 ft. square at eaves at height of 88 ft. 9 in., with pyramidal roof. (Abstract.)

Shaft Illumination. Recent Improvements in the Illumination of Mine Shafts (Die neueren Fortschritte der Grubenbeleuchtung). Elektrotechnischer Anzeiger, vol. 37, no. 31, Feb. 24, 1920, pp. 147-148, 2 figs. Describes new patented construction by Schneider & Co., Frankfurt, in which the opening of a hinged lamp-protecting globe cuts off current from the incandescent lamp before the explosive firedamp can enter.

Shaft Lining. Concreting the Chief Consolidated Shaft at Eureka, Utah, R. D. Gardner. Eng. & Min. Jl., vol. 110, no. 10, Sept. 4, 1920, pp. 460-462, 3 figs. Work of lining was carried on simultaneously with sinking and was done in stages of 50 to 60 ft., according to nature of ground. Average advance, 61 ft. per month. Precast dividers used.

Shaft Sinking. See SHAFT SINKING, Mines.

Siberia. The Mining Opportunities in Siberia Under the Present Régime of Zemstvo-Soviet Government, Ivan Narodny. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14, 1920, pp. 306-308. Author states that although mining enterprises will be under control of government there is "a fine opportunity and an enormous field for the new activity."

Signaling. Designing Mine Signal Systems, R. H. Bacon. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 372-375, 4 figs.; also Eng. & Min. Jl., vol. 110, no. 8, Aug. 21, 1920, pp. 361-362, 4 figs. It is said that all estimates should be designed with following points in mind, the order showing their relative importance: (1) Safety, (2) reliability, (3) speed of operation, (4) low maintenance cost, and

(5) simplicity. Costs of modern system for 3000-ft. shaft.

Stench Warnings. Stench Warnings in Metal Mines, A. C. Fieldner and S. H. Katz. Reports of Investigations, Bur. of Mines, serial no. 2153, Aug. 1920, 3 pp. Investigations are said to have demonstrated that warnings which are perceived by miners through sense of smell are "exceedingly simple to install and are on the whole as effective as any other system heretofore used."

See also Safety.

Submarine. See SUBMARINE MINES.

Surveying. Short Cuts in Mine Surveying, Douglas Waterman. Min. & Sci. Press, vol. 119, nos. 21 and 22, Nov. 22 and 29, 1919, pp. 749-752 and 773-779, 5 figs. Illustrating use of protractor and parallel-ruler in plotting survey made with Brunton compass, and manner of making stadia measurements.

Taxation. Federal Taxation of Mines, L. C. Graton. Bul. Am. Inst. Min. & Met. Engrs., no. 155, Nov. 1919, pp. 2957-2998 and (discussion) pp. 2998-3007. Outline of tax laws and account of method of their administration.

Taxes, Effect on Mine Accounting. Tax Problem Effect on Mine Accounting, Henry B. Fernald. Min. & Metallurgy, no. 160, April 1920, pp. 16-18. Overlapping of state and federal tax laws is pointed out and its effect on mine accounting discussed.

Timbering. See MINE TIMBERING.

Trolley Wiring. Correct Method of Trolley-Wiring Mines, M. W. Beddow. Coal Age, vol. 17, nos. 17 and 18, April 22 and 29, 1920, pp. 796-798 and 844-848, 23 figs. April 22: Instructions in regard to planning dead-ends and suspensions so as to reduce maintenance charges. April 29: Standard section insulators, anchors, protection boards, methods of hanging curves and placing frogs, and wire splices.

Valuation. A Calculator for Mine Valuation, Ross B. Hoffmann. Min. & Sci. Press, vol. 119, Jan. 10, Dec. 27, 1919, pp. 925-929, 3 figs. Suggested graphical method for applying equation giving net yield per annum in terms of capital expenditure, annual rate of interest and redemption factor.

Ventilation. Mechanical Ventilation at Lake Mine, Lucien Eaton. Min. & Metallurgy, no. 164, Aug. 1920, pp. 28-29, 1 fig. Air goes down airshaft to 415-ft. sublevel, where it is split in two and passes up to 398-ft. sublevel through raises. Ventilation of stopes along route of air current is by diffusion aided by movement of cars and by some leakage through caved ground. An average of 225 cu. ft. per minute per man is provided.

Problems in Mine Ventilation, Walter S. Weeks. Min. and Sci. Press, vol. 121, no. 4, July 24, 1920, pp. 117-122, 9 figs. Discusses problem of predicting amount of air that a given fan will circulate if resistance is known, a problem which occurs in tunnel-driving where the air is forced to the breast through an ever increasing length of pipe.

The Friction of Ventilating Currents, Walter S. Weeks. Min. & Sci. Press, vol. 120, no. 17, Apr. 24, 1920, pp. 607-610, 4 figs. Author discusses salient points on subject of mine ventilation, dealing entirely with mechanical ventilation. Gives fundamental formula for resistance to flow from which, it is claimed, all other formulæ that deal with friction of air are derived.

Ventilation in Shaft Sinking, H. Joosten. Colliery Guardian, vol. 118, nos. 3054 and 3055, July 11 and 18, 1919, pp. 91-92 and 159-160, 22 figs. Details of sinking derrick with ventilating appliances. Methods for coupling up lengths of pipe by means of flanges tightened with bolts or clamps and sleeves. Translated from Glückauf.

See also FANS, CENTRIFUGAL, Theory of.

Water-Neutralization. Mine-Water Neutralization Plant at Calumet Mine, L. D. Tracy. Min. & Metallurgy, no. 161, May 1920, pp. 29-30, 1 fig. Plant neutralizes water and extracts six tons of ferric oxide per day from it as by-product.

Neutralizing of Acid Mine Water on the Witwatersrand and Settlement and Treatment of Sludge formed thereby, F. Wartensweiler. Jl. South African Instn. Engrs., vol. 18, no. 3, Oct. 1919, pp. 46-53. Based on data obtained as result of experimental investigations.

Welfare Work. See WELFARE WORK, Mines.

[See also under name of mineral or metal, as COAL MINES, COPPER MINES, etc.]

MINING

Accident Prevention in. Hazards Met in Open-Cut Mining, D. E. A. Charlton. Eng. and Min. Jl., vol. 110, no. 14, Oct. 2, 1920, pp. 665-669. Fewer dangers at open-pit properties than generally found in underground mines. Methods of accident prevention mainly those which depend on instruction, although safety appliances are used on all machinery. Paper read before Ninth Annual Safety Congress.

Athens System. Athens System of Mining, S. R. Elliott. Min. & Metallurgy, no. 164, Aug. 1920, pp. 23-24, 4 figs. Mining methods at Athens mine, 2500 ft. deep.

Bookkeeping Work in. Mine Bookkeeping, C. B. Holmes. Eng. & Min. Jl., vol. 109, no. 1, Jan. 3, 1920, pp. 22-26, 1 fig. Condemns use of complicated card systems and emphasizes importance of compiling daily reports of tonnages and labor costs.

Cost Reduction in. Opportunities for Reducing Mine Costs by Standardizing Equipment, Warren R. Roberts. Coalage, vol. 17, no. 25, June 17, 1920, pp. 1266-1268. Uniform mine-track gages and tipple clearances advocated to reduce accidents and as beneficial to operator and manufacturer.

The Cost of Mining as Influenced by Poor Development, A. G. Wolf. Eng. & Min. Jl., vol. 110, no. 12, Sept. 18, 1920, pp. 565-566. Money and time loss through unnecessary footage of drifts and cross-cuts illustrated by concrete example.

Electrical Machinery for. Apparatus for the Improvement of the Power-Factor in Mining Electrical Machinery, A. W. Ashton. Trans. Instn. of Min. Engrs., vol. 59, no. 3, July 1920, pp. 223-242 and (discussion) 242-246, 12 figs. Consideration of question of improvement of power factor and means of improvement.

Electricity in. The Bunker Hill Enterprise, T. A. Rickard. Min. and Sci. Press, vol. 121, nos. 6 and 7, Aug. 7 and 14, 1920, pp. 195-200 and pp. 227-231, 7 figs. Use of electricity in operation of mine, mill and smelter.

Explosives for. See also LIQUID AIR, Production of.

Geophones, Use in. See GEOPHONES, Uses.

Ground Sinking. Ground Sinking Caused by Excavating and Tunneling (Ueber Bodensenkungen durch Berg und Tunnelbau), Vincenz Pollack. Zeitschrift des Oesterreichische Ingenieur- u. Architekten-Vereines, vol. 71, nos. 39 and 43, Sept. 26 and Oct. 24, 1919, pp. 353-355 and 391-393, 38 figs. Special reference to occurrences and experiments in France. Address before Mining and Metallurgical Engineers.

High Altitudes, Work at. Mining at High Altitudes, Stanley C. Bullock. Min. Mag., vol. 22, no. 1, Jan. 1920, pp. 22-24, 3 figs. Writer records his experience of mining and milling in the Andes at altitude of 16,000 ft., and discusses particulars of conditions under which work can best be done.

Industrial Relations. The Bunker Hill Enterprise, T. A. Rickard. Min. and Sci. Press, vol. 121, no. 10, Sept. 4, 1920, pp. 335-343, 5 figs. Labor troubles. Management of mine.

Liquid Air as Explosive. See EXPLOSIVES, Liquid Air.

Loading Machines. See COAL MINING, Loading Machines.

Management in. How Shall We Get Mining Efficiency? Edwin H. Higgins. Eng. & Min. Jl., vol. 109, no. 26, June 26, 1920, pp. 1398-1406. List of materials requiring systematic attention on the part of mine managers and superintendents, and approved method of systematic observations and administration.

Military. See MILITARY MINING.

Production Statistics. Review of Mining. Min. Mag., vol. 22, no. 2, Feb. 1920, pp. 71-74. Statistics of production in Transvaal, Rhodesia, West Africa, Nigeria, Australasia, India, Malaya, Siam, Cornwall, British mines, English oil, Vanada, Siberia, Norway, Colombia, Peru and Venezuela.

Shaft Sinking. See SHAFT SINKING, Mines.

Shot Firing, Electric. Electric Shot Firing, MM. Taffanel, Dautriche, Durr and Perrin. Colliery Guardian, vol. 119, no. 3093, April 9, 1920, pp. 1009-1011, 7 figs. Description of various types of exploders used in shot firing, specially types mentioned in French list permitted for use in fiery mines. Translated from Annales des Mines.

Shovels and Conveyors for. See EXCAVATORS, Use in Tunneling and Mining.

Stoping. See ROCK DRILLS, Jackhammer.

Sweden. Swedish Minerals and the Metallurgical Industry in Germany during the War (Les minerals suedois et l'industrie sidérurgique allemande pendant la guerre), Paul Nicou. Annales des Mines, vol. 9, no. 6, 1920, pp. 339-487. Part played by Sweden in supplying Germany with metals, particularly during the war. Statistics of Swedish metal production, and description of operation of some of large iron mines during the war years; also, of Baltic ports, whence minerals were exported to German coast towns.

MINING ENGINEERING

Progress in 1919. Mining Engineering in the United States in 1919, P. R. Barbour. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 139-141. Mining engineering industry, writer contends, has been obliged to devote its efforts almost solely to non-technical matters, such as solving strikes, curtailment and industrial problems, mine taxation and like questions, but he observes that some of the results of mining engineering efforts along public lines have been noteworthy.

MINING INDUSTRY

Glossary. A Glossary of the Mining and Mineral Industry, Albert H. Fay. Dept. Interior, Bur. Mines, bul. 95, 1920, 754 pp. Contains about 20,000 terms, including both technical and purely local terms related to metal mining, coal mining, quarrying, petroleum and natural gas, and metallurgical works, as well as names of important common minerals and rocks, and geological terms.

Health of Workers. Is the Health of Mine Workers Adversely Affected by Mine Conditions? C. L. Green. Coal Age, vol. 17, no. 13, March 25, 1920, pp. 598-599. Sickness records of mine-working families presented show that mine workers enjoy better health than other people and that tuberculosis does not seem as prevalent among them as among other workers.

Increasing Production. The Duty of the Mining Industry, George Otis Smith. Min. & Sci. Press, vol. 119, no. 22, Nov. 29, 1919, pp. 782-784. Emphasizes importance of increasing production of raw materials. Address delivered before Min. Congress.

Labor Problem in. See INDUSTRIAL RELATIONS, Mining Industry.

Management in. See INDUSTRIAL MANAGEMENT, Mining Industry.

Welfare Work. McDowell County, Coal Mining Being Almost Sole Industry, Provides Free Dentistry. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 743-744. Thirteen dentists and as many hygienists visit schools three times a year and take care of children's teeth, recording condition and health of little patients.

MINING LAWS

Coal Mining. Coal Mining Laws Compared, Alex Moss. Coal Age, vol. 17, no. 4, Jan. 22, 1920, pp. 171-172. Tabulations of requirements of mining laws in regard to quantity of air, number of men on each split, spacing of cross-cuts, distance in advance of air, number of men allowed in mines with single openings, distance between openings, spacing of refuge holes, clearance for cars and drilling for water.

Court Decisions. Abstracts of Current Decisions on Mines and Mining, J. W. Thompson. Dept. of Interior, Bureau of Mines, bul. 181, law serial 19, 1919, 175 pp. Concerning minerals and mineral lands, public lands, eminent domain, mining corporations and partnerships, mining terms, mining claims, and statutes relating to mining operations.

United States. Federal Mining Legislation in 1919, James R. Jones. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 143-145. Statutes quoted as affecting mining industry are War-Minerals Relief Act, act authorizing mining on Indian reservations, appropriations for Bureau of Mines and Geological Survey, and joint resolutions in respect to assessment work.

MINING, MILITARY

Australian Company, France. Notes on the Work of an Australian Tunnelling Company in France, O. H. Woodward. Australasian Inst. of Min. & Metallurgy, Proceedings, no. 37, March 31, 1920, pp. 1-53, 23 figs. Historical and descriptive account.

Tunneling. Tunneling in the Sand Dunes of the Belgian Coast, H. Tatham. Bul. of Instn. of Min. & Metallurgy, no. 188, May 1920, 12 pp., 8 figs. Also in Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 178-179, 8 figs. Work done by tunneling companies. It consisted (1) of wells, (2) dugouts, and (3) sinking elephant shelters.

MIXING MACHINES

Counterflow Type. Mixing Machines (Mischmaschinen), R. Engelbrecht. Kali, vol. 13, no. 24, Dec. 15, 1919, pp. 411-412, 3 figs. Describes a counterflow machine and the Kost & Geissler mixing machine, both developed by the firm of Eisenwerk, Inc., Hamburg. Latter can be used where two or more different, powdery or granular, but not oily or sticky, materials in dry or semi-dry condition are to be mixed; whereas counterflow machines can be used for mixing moist as well as dry, and pulp-like materials and is especially adaptable for materials which do not mix readily.

MNEMONIC CLASSIFICATION

See TAYLOR SYSTEM, Mnemonic Classification.

MODULIMETER

See MEASURING MACHINES, Modulimeter.

MOLDERS

See WOODWORKING MACHINES, Molder.

MOLDING MACHINES

Cylindrical Molding. Molding Machines (Les machines à mouler), M. Lefèvre. Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 11-18, 14 figs. Machines for cylindrical molding.

French. Molding Machines and the Preparation of Model Patterns (Les machines à mouler et la préparation des plagues modèles). Fonderie Moderne, no. 9, Sept. 1919, pp. 194-198, 9 figs. Patents recently granted to Etablissements Glaenzer et Perraud, Paris.

Selection. Points to be Considered in the Selection of a Molding Machine (Gesichtspunkte bei der Wahl einer Formmaschine), Georg Hoffmann. Stahl u. Eisen, vol. 40, nos. 9, 13 and 17, Feb. 26, April 1 and 29, 1920, pp. 281-289, 426-432 and 575-581, 31 figs. Details of the various types of machines with description of different molding methods, and comparison of their relative merits.

MOLDING METHODS

Automobile Parts. Speed Marks Auto Parts Molding, D. M. Avey. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 852-857, 13 figs. Methods of molding cylinder and crankcase block, transmission housings and cylinder heads, developed by Am. Foundry Co., Indianapolis.

Engine Beds. See Marine Engines, Beds, Molding.

Evaporator Steam Belt. Loam Mold for Evaporator Steam Belt. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 811-816, 9 figs. Example of loam-molding job recently completed in gray-iron foundry. Casting forms steam belt for evaporator and constitutes part of installation in sugar mill.

Large Gas Main. Casting Pipe Specials in Green Sand. Engr., vol. 130, no. 3375, Sept. 3, 1920, p. 226, 4 figs. Procedure employed in casting large branch piece for gas main.

Propeller Shaft Brackets. See SHIP CONSTRUCTION, Castings.

Ship Propellers. Molding Propeller in Green Sand from Old One, John J. Eastham. Can. Foundryman, vol. 11, no. 6, June 1920, pp. 142-143, 5 figs. It is pointed out that so long as molder has any guide to go by he can produce good results; impression left by good blades give exact outline for made-up ones.

Ship Work. Castings for Ship Construction, Ben Shaw and James Edgar. Foundry, vol. 48, nos. 3 and 4, Feb. 1 and 15, 1920, pp. 89-91 and 140-145, 37 figs. Feb. 1: Illustrates method of casting large stern frame; Feb. 15: To conserve floor space it is recommended that a pit be bricked up in floor corresponding in shape to required casting. Contraction problems discussed.

MOLDING SAND

See SAND, MOLDING.

MOLECULAR VOLUME

Study of. A Study of the Molecular Volume (Zur Kenntnis des Molekularvolums), W. Herz. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 3, Oct. 1, 1919, pp. 226-230. It is pointed out that the molecular volumes at absolute zero are greater than the true molar volumes, and the difference between both magnitudes increases with increasing weight of molecules. Paper includes tables of comparative volumes of various organic liquids with increasing weight of molecules. From the Physical-Chemical Department of the Breslau University.

MOLECULES

See MATTER, Structure of.

MOLYBDENITE

Deposits. Molybdenite Deposits of Lacorne Township, Abitibi, P. Q., Adhemar Mailhiot. Can. Min. Jl., vol. 41, no. 7, Feb. 18, 1920, pp. 135-138, 4 figs. Outline is given of both general and economic geology and description of work done on veins individually.

Flotation of. Flotation of Molybdenite at Empire, Col., Will H. Coghill and J. P. Bonardi. Eng. & Min. Jl., vol. 109, no. 22, May 29, 1920, pp. 1210-1215, 1 fig. It is said that by using steam-distilled pine oil as flotation agent and avoiding excessive reduction in grain size, tailing losses were diminished.

Photoelectric Properties. Some Optical and Photoelectric Properties of Molybdenite, W. W. Coblentz and H. Kahler. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 338, pp. 121-162, 22 figs. Data on change in electrical conductivity of molybdenite when exposed to thermal radiations of wave lengths extending from 0.36 μ in ultra-violet to beyond 9 μ in infra-red. Also in Jl. Wash. Acad. Sci., vol. 9, no. 18, Nov. 4, 1919, pp. 537-539.

MOLYBDENUM

Deposits. See MINERALS, Deposits, Idaho; MOLYBDENITE; MOLYBDITE.

Determination of. Determination of Molybdenum, J. P. Bonardi and Edward P. Barrett. Dept. of Interior, Bur. of Mines, technical paper 230, 1920, 35 pp. Results of work done by Bureau of Mines in coöperation with College of Mines, University of Washington, and Colorado School of Mines. Volumetric and gravimetric methods were compared experimentally.

The Application of the Rotating Zinc Reductor in the Determination of Molybdenum, Walter Scott. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 578-580. Experiments in which molybdic acid in dilute sulphuric acid was reduced by rotating zinc cylinder both with and without aid of electrolytic current.

Production. See MINERALS, Production in U. S.; MANGANESE, Production in 1919.

MOLYBDENUM STEEL

Calcium Molybdate Additions. Calcium Molybdate as an Addition Agent in Steel Making, Alan Kissock. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1018-1020. Best results are said to be secured by introducing molybdate immediately after skimming of first, or phosphorous slag, white slag indicating that reduction has been complete. In open-hearth practice it is necessary that molybdate be added in early stages of heat, preferably just before melt becomes "level."

Chrome-Molybdenum and Nickel-Molybdenum. Effect of Molybdenum in Chrome and Nickel Steels. Ry. Age, vol. 68, no. 12, Mar. 10, 1920, pp. 955-957, 7 figs. Photomicrographs of chrome-molybdenum steel showing similarity of microstructure at various drawing temperatures are presented as well as charts and data giving properties of chrome-molybdenum steel quenched in water and in oil and drawn at various temperatures; and of nickel-molybdenum steel drawn at various temperatures.

Figures are based on tests of material used in automobiles, aviation engines and tanks.

Commercial, Data on. Commercial Molybdenum Steel Test Data. Raw Material, vol. 2, no. 3, Mar. 1920, pp. 87-91, 6 figs. Test results obtained by Carbon Steel Co., Pittsburgh, Pa., are tabulated and charts are given which indicate influence of heat treatment upon various physical properties of metal.

Determination of Molybdenum. Determination of Character and Quantity of Molybdenum in Steel and Iron (Ueber den Artund Mengennachweis des Molybdäns im Stahl und Eisen), Siegfried Laurens Malowan. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 1, Aug. 13, 1919, pp. 73-80, 1 fig. Deals with a color reaction of molybdenum which, it is claimed, has never been used in elementary analysis. Writer, after investigating action of xanthic acid and its salt on molybdenum compounds, seeks to demonstrate their adaptability for a given amount of molybdenum in steel.

Fractures, Woody. On the Woody Structures of Fractures of Transverse Test-Pieces Taken from Certain Special Steels, J. J. Cohade. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 421-423, 7 figs. Tests of treatments intended to improve results from test bars cut transversely from molybdenum steels. Quenching prior to forging effected no improvement and fractures were "woody," whether forging was carried out between 1100 deg. C. and 950 deg. C. or between 950 and 800 deg. C.

Properties. Molybdenum and Molybdenum Steel, W. E. Simpson. Min. & Sci. Press, vol. 119, no. 25, Dec. 20, 1919, pp. 894-896. As example of toughening property imparted to steel by addition of over one per cent molybdenum, it is mentioned that plates of war tanks, which were made of this steel were unaffected by machine-gun fire at ten yards point-blank range. Commercial applications of molybdenum steel, particularly in mining industry, are quoted.

Molybdenum in Commercial Alloy Steel. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 407-409, 1 fig. Effect on physical properties and heat-treatment temperature range when substituted for portions of nickel or chromium. Graph is included showing relative properties of chrome-molybdenum steel at various temperatures and heat-treatment conditions. From book soon to be published by Climax Molybdenum Co.

Qualities. The Qualities of the Molybdenum Steels. Automotive Industries, vol. 42, no. 5, Jan. 29, 1920, pp. 358-361, 9 figs. Elastic limit, tensile strength, elongation percent and reduction of area are quoted and photomicrographs are presented of alloy containing 0.32 per cent. carbon, 0.49 per cent. manganese, 0.10 per cent. silicon, 0.90 per cent. chromium and 0.10 per cent. molybdenum.

Structural Types. Molybdenum in Structural Steels, G. W. Sargent. Iron Age, vol. 106, no. 10, Sept. 2, 1920, pp. 579-581, 5 figs. Metallurgy and properties of molybdenum steels. Types for structural purposes. Commercial features. Paper read before Am. Soc. for Testing Matls.

[See also CHROME STEEL, Chromium-Molybdenum; STEEL, HIGH-SPEED, Molybdenum vs. Tungsten.]

MOLYBDITE

Deposits, U. S. Molybdite: Its Occurrence, Detection and Determination in Partly Oxidized Molybdenite Ores, J. P. Bonardi. Chem. & Metallurgical Eng., vol. 23, no. 5, Aug. 4, 1920, pp. 205-206. Review on composition of molybdite ore, its occurrence and concentration. Chemical test for molybdite in presence of molybdenite. Outline of methods for qualitative and quantitative analysis.

MONAZITE

Sources and Properties. Monazite (Ueber Monazit), C. Doelter. Edel-Erden und-Erze, vol. 1, no. 2, Oct. 1, 1919, pp. 1-3. Notes on analysis and synthesis of monazite, its radioactivity and the chief sources of its supply.

MONEL METAL

Analysis. A Rapid Method for the Analysis of Monel Metal, Philip Covitz. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1919, pp. 31-32. Combination of various known rapid volumetric and gravimetric methods.

Casting. Pointers on Casting Monel Metal, Reginald Trautschold. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 649-651, 4 figs. Difficulties to be met by reason of high melting point and large shrinkage.

Foundry Practice for. Foundry Standardizes Nickel Alloy, H. E. Diller. Foundry, vol. 48, no. 6, Mar. 15, 1920, pp. 209-212, 6 figs. It is reported that molds for monel metal castings are made of silica sand and rated similarly to those made for steel, and that electric furnaces will supplant old-style melting mediums.

Machining Castings. Machining Monel-Metal Castings, A. J. Hanlon. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 341-343, 6 figs. Specifications for lathe tools for turning and threading monel-metal castings.

MORTALITY TABLES

Formulas for. Formulas for Constructing Abridged Mortality Tables for Decennial Ages, C. H. Forsyth. Bul. Am. Math. Soc., vol. 26, no. 1, Oct. 1919, pp. 34-38. Based on method presented by George King in British Registrar-General's Report for 1914 for constructing Abridged Mortality Tables which consist merely of values appearing in ordinary mortality table but corresponding only to each quinquennial age.

MORTARS

Cement. Contraction of Cement Mortar in the Air (Schwindlung von Zementmörteln an der Luft), M. Gary. Deutscher Ausschuss für Eisenbeton, second report, no. 42, 1918, 35 pp., 16 figs. Tests are said to have shown that by using not too finely ground cement burned at intense heat, and sand of not too high a density and which does not absorb much water, and furthermore by keeping the mixture moist as long as possible, contraction encountered in mortars generally used, and therefore of concrete, may be reduced to a minimum.

The Consistency of Portland Cement Mortar and Concrete, H. G. Lloyd. Concrete & Constructional Eng., vol. 15, no. 6, June 1920, pp. 411-415 and (discussion) pp. 415-418. Writer attempts to eliminate differences in mortars and cements due to differences of consistency, and describes a method for determining standard consistency, and also for describing on rational basis, one which is greater or less than standard consistency. Abstract of paper read before Concrete Inst.

Fireclay. Fireclay Mortars for Laying Fireclay Brick, Raymond M. Howe. Chem. & Metallurgical Eng., vol. 23, no. 6, Aug. 11, 1920, pp. 232-234, 7 figs. Experiments conducted at Mellon Inst. of Industrial Research. Data obtained show that addition of lime, portland cement, asbestos, and salt affects quality of fireclay, addition of only 5 per cent of these materials lowering fusion point about 200 deg. fahr. Waterglass and carborundum did not exert so marked an influence.

Mixing Machine. A New Mortar-Mixing Machine (Neue Mortelmischmaschine). Tonindustrie, vol. 43, no. 38, Mar. 29, 1919, pp. 272-273, 3

figs. Machine in which mixing material is brought on car whose body, which can be tilted on all sides, forms part of mixing drum.

Plasticity and Measurement of. Measurement of Plasticity of Mortars and Plasters, Warren E. Emley. Technologic Papers of Bur. of Standards, Dept. of Commerce, no. 169, June 28, 1920, 27 pp., 8 figs. Plasticity of mortars is defined as ability to retain water against suction of surface to which mortar is applied and readiness to spread over the surface. Instrument for measuring plasticity so designed is described.

MORTISING MACHINES

New Type. Improved Key-Seating and Mortising Machine. Engineer, vol. 128, no. 3330, Oct. 24, 1919, pp. 416-417, 6 figs. Arrangement for producing mortices is so designed that two cutters approach center of work simultaneously until they are ⅛ in. apart, whereupon traverse of rear spindle head is reversed so latter is withdrawn while front spindle head continues its forward feed until thin remaining wall is cut away.

MOSQUITOS

Extermination. See SANITATION, Fly and Mosquito Elimination.

MOTION

Recording Apparatus. A New Recording Apparatus for the Study of Dynamical Laws and the Composition of Vibratory Motion (Un nouvel appareil enregistreur pour l'étude des lois de la dynamique et la composition des mouvements vibratoires), Paul Bud. Nature (Paris), nos. 2403 and 2404, May 8, 1920, pp. 230-234, 15 figs. Modified Atwood machine. Aluminum drum is attached to pulley and rotates with it. Motion is recorded by suitable mechanism on paper strip passing over pulley and set in motion by aluminum drum.

MOTION-PICTURE PHOTOGRAPHY

Cinema Outfits, Portable. Recent Developments in Types of Portable Cinema Outfits, J. W. Barber. Illuminating Engr., vol. 13, no. 6, June 1920, pp. 179-183 and (discussion) War, pp. 184-188. References are specially made to cinemators used extensively during war by British Ministry of Information and Nat. Aims Committee, and pathescope, which with its 6-watt lamp projects picture 4 ft. in width, approximating 12 sq. ft.

Developing Films. Developing, Printing and Assembling of Motion-Picture Film, L. W. Chapman. Chem. and Metallurgical Eng., vol. 23, no. 3, July 21, 1920, pp. 97-99, 8 figs. Description of process as conducted in two laboratories of Famous Players-Lasky Corporation at Los Angeles, Cal., at which nearly a million ft. of film is used per wk.

Natural-Color. Cinematographic Pictures in Natural Colors, by Gaumont Trichromatic Process (Le cinématographe en couleurs naturelles par le procédé trichrome Gaumont), A. Bidault des Chaumes. Génie Civil, vol. 76, no. 10, Mar. 6, 1920, pp. 245-251, 31 figs. Photographic camera for taking pictures has three objectives, each of which is provided with filtering colored glass, the three colors being complementary. Three pictures are taken and later exposed on screen simultaneously, camera for exposing films being designed with three objectives disposed to permit exact merging of images. Objectives in exposure camera also carry filtering colored lenses. The three pictures are located lengthwise in film, so each successive exposure involves passage of three pictures, but size of each picture is smaller than in ordinary film.

Ultra-Rapid. Chronophotography of Projectiles at the Rate of 15,000 to 20,000 Images per Second (Chronophotographie des projectiles à raison de 15,000 à 20,000 images par seconde), Jacques Boyer. Nature (Paris), no. 2411, June 19, 1920, pp. 337-341, 8 figs. Bull electric apparatus.

Electric Ultra-Rapid Cinematographic Camera and Its Application to the Study of the Movement of a Projectile (Dispositif électrique de cinématographie ultra-rapide et son application à l'étude du mouvement des projectiles), Revue générale de l'Électricité, vol. 7, no. 4, Jan. 24, 1920, pp. 125-26. Operation of apparatus devised by H. Abraham and L. and E. Bloch for obtaining series of electric sparks following one another at rate of 10,000 or more per sec. and how this apparatus has been adapted by L. Bull to the ultra-rapid camera.

Shooting Flying Bullets With a Camera. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 147-149, 5 figs. Electrical equipment employed by Dr. Bull, sub-director of Marey Inst. in Paris, for studying ballistic phenomena, and of optical and photographic system employed by him. Translated from Nature (Paris).

The Ultra-Rapid Cinematograph taking Pictures at the Rate of 20,000 per Second. Sci. Am. Monthly, vol. 1, no. 3, Mar. 1920, p. 217, 1 fig. Principle of operation consists in charging up to about 5000 volts small Leyden jar which is immediately discharged in discharger, being then freshly charged from source of high tension electricity (12,000 to 15,000 volts). Object which is photographed is illuminated by series of sparks from jar. Translated from Comptes rendus des Séances de l'Académie des Sciences.

Ultra-Rapid Cinematography (Sur la cinematographic ultra-rapide), H. Abraham, E. Bloch and L. Bloch. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1031-1033, 1 fig. Method in which condenser discharges are interrupted by compressed air, for taking pictures at rate of over 20,000 per second.

MOTION PICTURES

Eyestrain. Interim Report of the Joint Committee Appointed by the Illuminating Engineering Society to Inquire into "Eyestrain in Cinemas." Illuminating Engr., vol. 13, no. 6, June 1920, pp. 189-193. Committee recommends that angle of elevation, subtended at eye of any person seated in front row by length of vertical line dropped from center of top edge of picture to horizontal plane passing through observer's eye shall not exceed 35 deg., height of eye above floor level being assumed to be 3 ft. 6 in., and that angle between vertical plane containing upper edge of picture, and vertical plane containing observer's eye and remote end of upper edge of picture should not be less than 25 deg.

MOTION STUDY

See SHIPYARDS, Launching.

MOTIONS

Composition of. The Photo-Ratiograph, Arthur C. Banfield. Machy. (Lond.), vol. 16, no. 403, June 17, 1920, pp. 342-344, 12 figs. Apparatus for photographing curves obtained from composition of pendulum and other oscillating machines.

MOTOR BOATS

Converted Patrol Boats. "M. L." Patrol Boats as Motor Yachts. Shipbuilding & Shipping Rec., vol. 14, no. 21, Nov. 20, 1919, pp. 584-587, 7 figs. Suggested method of conversion to twin-screw kerosene-engined pleasure cruisers, with speed of 11 knots and radius of operation of 450 nautical miles.

Engines. See TRACTOR ENGINES, Motor Boats, Adapting to.

New York Show. New York's Fifteenth Motor Boat Show, William B. Rogers, Jr. Motor Boat, vol. 17, no. 4, Feb. 25, 1920, pp. 5-32, 39 figs. Notes on boat designs, motors and accessories exhibited.

Olympia Show. The Motor Boat and Marine and Stationary Engine Exhibition—I. Engr., vol. 129, nos. 3351, 3352 and 3353, Mar. 19 and 26 and Apr. 2, 1920, pp. 302-303, 320-322, 7 figs., and 345-348, 5 figs. Striking features of principal types exhibited. Mar. 26: Gleniffer 6-cyl. engine and propeller-reversing gear, and Bolnes hot-bulb engine. Apr. 2: Thornycraft kerosene engines and Beardmore hot-bulb engines.

Rowboat Engine. Outboard Engines (Aussenbordmotoren), Max Barth. Elektrotechnische Rundschau, vol. 37, nos. 1 and 2, Jan. 7 and 21, 1920, pp. 1-2 and 5-6 (Polytechnische Rundschau section), 5 figs. Describes the Möve engine, a 2-cylinder, gasoline 2-stroke motor for attaching to stern of a rowboat and adapted not only to extended pleasure cruises, but also for inspection cruises in connection with waterway construction, handling traffic between ships in harbor and mainland, etc.

30-Ft. Cruiser. Katherine, a Hand 30-Foot Cruiser, Wm. H. Hand, Jr. Motor Boating, vol. 25, no. 3, Mar. 1920, pp. 20-22 and 90, 94 and 96, 9 figs. Specifications: Length, 30 ft.; beam, 8 ft. 6 in.; draft, 2 ft. 9½ in.

Tractor Engines in. See TRACTOR ENGINES, Motor Boats, Adapting to.

MOTOR BUSES

Electric-Railway, Use of. Motor Buses as Railway Auxiliaries. Elec. Ry. Jl., vol. 56, no. 15, Oct. 9, 1920, pp. 707-709. Statistics of operation of motor buses by electric railway company.

English. English Design and Operation of Motor Bus, M. W. Bourdon. Automotive Industries, vol. 43, nos. 6, 7 and 8, Aug. 5, 12 and 19, 1920, pp. 258-260, 312-315 and 363-366, 19 figs. Aug. 5: Takes up restrictions and conditions that apply to structure and service showing particularly some of factors that regulate operation. Aug. 12: Pre-war "B" type bus and post-war "X" type. Aug. 19.: Description of body of "K" type.

The British Single Deck Bus Development, M. W. Bourdon. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 606-609, 5 figs. Designs of buses popular in England, outside of London.

Truck Chassis Much Used for English Provincial Buses, M. W. Bourdon. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 463-465, 3 figs. Dimensions: Wheel base, 170 to 190 in.; track, 65 to 67 in.; overall length of chassis, 260 to 300 in.; ground clearance, 10 to 12 in.

Metal-Framed. Metal-Framed Motor Omnibus Body. Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 406-408, 14 figs. Development from steel construction for aircraft. Constructed by Aircraft Steel Construction Co., Engineers, London, England.

New York. Motor-Bus Transportation, G. A. Green. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 67-74, 1 fig. Organization of Fifth Avenue Coach Co., New York.

Motor Bus Transportation in New York, George A. Green. Elec. Ry. Jl., vol. 56, no. 4, July 24, 1920, pp. 175-178. Organization and operating details of Fifth Ave. Coach Co., New York, with special details regarding engineering, research, and transportation departments.

The Place of the Bus, Walter Jackson. Elec. Ry. Jl., vol. 55, no. 22, May 29, and vol. 56, no. 1, July 3, 1920, pp. 1088-1093 and 11-15, 6 figs. May 29: Reasons for installing, and method of operating municipal lines in New York City. July 3: Laws relating to motor-bus operation in existence in various states and cities.

Operating Costs. Motor Bus and Tramway Service, A. R. Fearnley. Aera, vol. 8, no. 5, Dec. 1919, pp. 573-578, 1 fig. Experience of manager is quoted as having demonstrated that average expenses of buses are 114 per cent higher than those of tramway cars.

The Possibilities of Further Economies in Road Transport, T. Clarkson. Engineer, vol. 128, no. 3331, Oct. 31, 1919, pp. 445-447. Based on examination of operating circumstances of a London omnibus company. Presidential address to Instn. of Automobile Engrs. Also in Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 397-400.

Six-Wheel. New Six-Wheel Center Entrance Bus. Elec. Traction, vol. 16, no. 9, Sept. 1920, pp. 663-664, 2 figs. Bus with body resembling street car body constructed and used in Akron, Ohio.

MOTOR CARS

Converted. Indian-Built Rail and Road Motor Vehicles, F. C. Coleman. Ry. Rev., vol. 65, no. 23, Dec. 6, 1919, pp. 829-830, 4 figs. More than five hundred pleasure motor cars were converted and fitted with transport bodies during war period by native Indian labor.

Electric. New Electric Motor Cars for the Long Island, S. B. Schenck. Ry. Age, vol. 68, no. 26, June 25, 1920, pp. 1964-1966, 5 figs. Structural details of cars used for multiple-unit trains operated by Long Island Railroad for suburban service.

Railway. See RAILWAY MOTOR CARS.

MOTOR CYCLES

See MOTORCYCLES.

MOTOR EXPRESS

Rural. Development of Rural Motor Express Throughout the United States. Better Roads & Streets, vol. 9, no. 6, July 1919, pp. 225-227, 4 figs. Suggested as solution to present deficiencies of transportation system.

MOTOR-GENERATORS

Rating. Motor-Generator Sets, G. H. Tappan. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 140-143, 3 figs. Basis on which motor-generators are rated. Method of compounding exciter to automatically take care of heavy overload is mentioned.

MOTOR PLOWS

German. German Motor Plows (Deutsche Motorpflüge). Oel- und Gasmaschine, vol. 16, no. 5-6, Aug.-Sept. 1919, pp. 65-86, 28 figs. Details and illustrations of motor-driven tractor plows. Reference is made to popular use in America of a motor tractor with trailer plow, which is said to be too heavy and otherwise impracticable for the highly cultivated German soil.

New Motor Plows at the Exhibition of the German Agricultural Society 1919 (Neue Motorpflüge auf der Ausstellung der Deutschen Landwirtschaftsgesellschaft 1919), Gustav Fischer. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 13-14, Apr. 3, 1920, pp. 294-298, 20 figs. Description of more important types of motor plows exhibited in Magdeburg, including the Delma, Hansa-Lloyd, Benz-Sending, Podeus, Büssing and other models. Most noteworthy progress said to be

shown in development of caterpillar tractors.

Lecler. Farm Machinery (La motoculture), F. Mirés. Vie Technique & Industrielle, vol. 1, no. 3, May 1920, pp. 104-108, 5 figs. Description of Lecler plow.

Tests. Foreign Motor Plow Construction in the Light of Comparative Tests Carried out at Säbyholm, Denmark [Studien über den Motorpflugbau im Ausland bei der Vergleichsprüfung in Säbyholm (Dänemark)], W. Kaul and O. Vorbach. Motorwagen, vol. 23, nos. 15, 16 and 17, May 31, June 10 and 20, 1920, pp. 254-264, 273-281 and 295-304, 59 figs. Describes Danish method of testing and gives details of American and other models tested with tabulated results of tests.

MOTOR SHIPS

See MOTORSHIPS.

MOTOR STARTERS

See ELECTRIC MOTORS, Starting Rheostats; TRANSFORMERS, Autotransformers, Motor-Starting.

MOTOR TRANSPORT

British, War. British Motor Transport in the War, Richard Twelvetrees. Military Engr., vol. 12, no. 62, Mar.-Apr. 1920, pp. 157-159. Describes conditions which developed many weaknesses in vehicles which operated satisfactorily on good roads under peace conditions, and gives points in design where special weaknesses developed, and where improvements have been or should be made. Address delivered before Soc. Engrs. (British).

MOTOR-TRUCK TRANSPORTATION

California. Freighting with Motor Trucks on Kern River Project No. 3. Eng. News-Rec., vol. 84, no. 19, Apr. 29, 1920, pp. 868-869, 2 figs. Experience gained in delivering 28,000 tons of freight to California job over a 50-mile haul on mountain roads.

Passengers and Freight Carried More Cheaply by Motor Transport Than by Railway, Kenneth Q. Volk. Eng. News-Rec., vol. 84, no. 12, March 18, 1920, pp. 568-571, 3 figs. It is said that good roads and favorable climate in California have permitted successful operation of interurban lines by large numbers of stage companies. List is given of principal stage companies, equipment in service, distance traveled and rates charged.

Coal. What the Deep Vein Coal Co. Has Learned About the Ship-by-Truck Movement, Donald Baker. Coal Age, vol. 18, no. 6, Aug. 5, 1920, pp. 278-281, 2 figs. It is said that five-ton motor trucks are able to haul coal for short distances cheaper than railroads and can deliver it to customer's cellar for much less than combined rail and wagon charge.

Comparison with Railways. Motor Truck vs. Railway (Lastkraftwagen oder Eisenbahn?), H. Christfreund. Verkehrstechnik, vol. 37, no. 6, Feb. 25, 1920, pp. 77-80, 2 figs. Investigation of the experience of extending railroad system by branch lines consisting of motor trucks. Tables giving transportation costs per ton-km. of the most important, commoner kinds of bulk freight transported by railroad and by a 5-ton Benz steel-tired motor truck with 44- to 50-hp. engine, and running at a speed of 15 km. per hr., together with overhead costs, etc.

Electric. Electric Truck Transportation as Developed in Germany, Ernst Valentin. Automotive Industries, vol. 42, no. 4, July 22, 1920, pp. 162-167, 16 figs. Problem of transporting goods and foodstuffs in interior where supply of gasoline is low and skilled drivers scarce. Heavy electric truck chosen as solution. Principal feature is standardized storage battery and charging methods adopted.

Highway Requirements. Motor Operation Costs as Affected by Highway Location and Grade Design, Wilson G. Harger. Eng. News-Rec., vol. 85, nos. 4 and 5, July 22 and 29, 1920, pp. 171-173 and 200-202, 5 figs. July 22: Value of eliminating rise and fall by cut and fill construction discussed. Simple case of farm-wagon trailer train explained. July 29: Comparison of alternate locations from standpoint of motor operating costs. Table of capitalized operating cost on different grades established.

Long-Distance. Engineering Problems of Long Distance Motor Transport. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1193-1195. Experiences of Motor Transport Corps in recent transcontinental trip.

Saving a Ton on the Long-Distance Truck Haul. Automotive Industries, vol. 43, no. 7, Aug. 12, 1920, pp. 308-310 and p. 320, 5 figs. It is claimed that truck often carries unnecessary load because body is improperly designed. Considerations of body design with a view to diminishing weight are presented.

Gasoline vs. Steam Vehicle. Road Transport by Steam Vehicles, P. W. Robson. Eng., vol. 110, no. 2847, July 23, 1920, pp. 123-126, 9 figs. Comparative costs of hauling five tons per mile by various steam and gasoline cars are given and it is estimated that annual saving over 15,000 miles by use of steam against gasoline vehicles is $5000 per vehicle. Paper read before Instn. Mech. Engrs.

Operating Costs. Motor Operation Costs as Affected by Highway Location and Grade Design, Wilson G. Harger. Eng. News-Rec., vol. 85, no. 3, July 15, 1920, pp. 104-107, 1 fig. "Mileage service" said to be prime consideration of general policy; extreme refinements of location impracticable; economic grade limits defined and recommended practice enunciated.

The Present Position of Mechanical Road Traction, C. G. Conradi. Engineering, vol. 108, nos. 2813 and 2814, Nov. 28 and Dec. 5, 1919, pp. 714-718 and 764-768, 51 figs. Nov. 28: Ways of effecting economies in transportation; comparison of costs of operating mechanically-and electrically-operated vehicles. Dec. 5: Characteristics of self-propelled vehicles and exposition of uses for which each type is suitable. Types considered are steam-driven, electrically-driven and gasoline-driven vehicles. Paper read before Instn. of Mech. Engrs. Also abstracted in Colliery Guardian, vol. 118, no. 3075, Dec. 5, 1919, pp. 1503-1504, 7 figs.

Railway Feeder Lines. Motor Truck Lines Successfully Operated by Interurbans. Elec. Traction, vol. 16, no. 3, Mar. 1920, pp. 157-160, 4 figs. How Milwaukee Elec. Ry. & Light Co. increased its express by successfully establishing motor-truck lines extending beyond rail terminals and acting as feeders to railway.

Railway Freight Terminals. Employing Motor Trucks in Trap Car Service, B. F. Fitch. Ry. Elec. Engr., vol. 11, no. 3, March 1920, pp. 98-100, 3 figs. Use of street-going vans at Cincinnati is said to effect great reduction in rail terminal congestion.

Motorizing Railroad Freight Terminals, B. F. Fitch. Ry. Rev., vol. 66, no. 12, March 20, 1920, pp. 459-463, 10 figs. System of motor transport for package shipments between substations in use at Cleveland is outlined and its application to New York is analyzed.

Relation to Increased Production. Relation of Highway Transportation to Increased Production, George M. Graham. Eng. & Contracting, vol. 54, no. 5, Aug. 4, 1920, pp. 106-109. Address delivered before Chamber of Commerce of U. S.

Stamper System. The Stamper System of Motor Transport. Eng. & Indus. Management, vol. 3, no. 17, Apr. 22, 1920, pp. 537-539, 7 figs. Description of a loading system which, it is stated, has the great advantage that it can be universally employed between any two points if amount of tonnage to be conveyed warrants its use, because it carries its own appliance for changing a full for an empty retainer, and vice versa, which appliance can be manipulated by one man, the driver, in a few minutes.

Transcontinental Convoy. The First Transcontinental Motor Convoy, E. R. Jackson. Mech. Eng., vol. 42, no. 3, March 1920, pp. 145-150 and 205, 16 figs. Convoy started from Camp Meigs, Washington, D. C., at 8 A. M. on July 7, 1919, and finished at San Francisco, Cal., on Sept. 6, 1919. Particulars are given of itinerary, personnel, operation and maintenance problems, and recommendations are formulated in regard to practical details of operation of a motor truck freight service.

MOTOR TRUCKS

Advantage Over Horses. 62 Motor Trucks vs. 500 Horses. Power Wagon, vol. 23, no. 180, Nov. 1919, pp. 27-28. Experience of food and provision house which conducts more than 500 retail groceries and 32 meat markets in New York City and vicinity.

Ammunition Transport. American Military Transport Chassis. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 6-9, 9 figs. Two-ton Nash quad used for ammunition transport, mobile repair shops, etc., by Am. Army in France.

Baico-Ford Conversions. Baico-Ford All-Steel Conversions. Motor Traction, vol. 30, no. 798, June 14, 1920, p. 580, 1 fig. Describes what is said to be successful method of adapting Ford-car chassis to carry a 25 cwt. load.

British War Models. Mechanical Transport in the War, Richard Twelvetrees. Soc. of Engrs. Jl. & Trans., vol. 10, no. 10, 1919, pp. 279-300 and (discussion) pp. 300-314, 8 figs. Models developed in England during war are analyzed and it is concluded that heavy vehicle will have to undergo much modification of detail, specially to eliminate defects developing as result of war and to avoid complicated designs.

Buessing. The Three-Ton Cardan Motor Truck of H. Büssing in Brunswick (Der 3 t-Kardan-Lastkraftwagen von H. Büssing in Braunschweig), A. Heller. Motorwagen, vol. 23, no. 8-9, Mar. 20-31, 1920, pp. 159-167, 28 figs. Details of the motor-truck chassis with 4-cylinder engine of 42 hp. with speed of 1000 r.p.m. to be used for a number of motor omnibuses in Berlin.

Churchill. The 3 Ton Churchill. Motor Traction, vol. 31, no. 814, Oct. 4, 1920, pp. 345-346, 4 figs. Characteristics: Engine, Tylor, 45 hp.; 5 in. x 6 in. bore and stroke; gear box, Gate change with separate lever for reverse; countershaft, bevel-driven differential; springs, deeply cambered semi-elliptic; track, 5 ft. 4½ in.; wheelbase, 15 ft.

Commer. A New 2-Ton Commer Car. Motor Traction, vol. 30, no. 791, Apr. 26, 1920, pp. 407-410, 7 figs. Particulars: Engine, four cylinders, 100 x 120 mm.; carburetor, Claudel-Hobson; speeds, three; drive, overhead worm.

Daimler. The Daimler Post-War English Truck Chassis, M. W. Bourdon. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 720-723, 6 figs. Knight sleeve valve engine and Lanchester worm gear mentioned as outstanding features of 2-ton model.

De Dion. 1920 3½-Ton deDion Chassis. Motor Traction, vol. 30, no. 775, Jan. 7, 1920, pp. 11-14, 13 figs. Specifications: engine, 25 h.p., 4 cyl., 100 x 140 mm.; lubrication pump; gears, four and reverse; final drive, internal gear; wheel-base, 13 ft. 5 in.

Design, Trend of. The 1920 Trend in Truck Design, J. Edward Schipper. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 135-137, 4 figs. Tendency to build trucks larger than two tons for pneumatic tire equipment is visualized as outstanding feature at beginning of year. Influence of Class B military truck, higher speed engines, influence of good roads, gains for internal gear final drive and prospect of increased prices are also pointed out.

Electric. 70-Cwt. Electric Battery Tipping Wagon. Eng., vol. 109, no. 2831, Apr. 2, 1920, pp. 446-448, 8 figs. Truck manufactured by Messrs. Ransomes, Sims and Jefferies, Ltd., Ipswich, England.

Engines. A Heavy-Duty High-Speed Engine, Otis E. Griner and Mark A. Smith. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 89-95, 11 figs. Universal truck and tractor engine designed by Midwest Engine Co. It is a four-cylinder, four-cycle vertical valve-in-head engine, with bore of 4½ in. and stroke of 6 in. Records of tests are included.

Dual Valve Motors in Expanded Pierce Truck Line. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 7-10, 7 figs. Engine is of four cylinder T-head type with 4½ inch bore and 6¾ inch stroke. Its S.A.E. horsepower is 32.4, but at governed speed of 12000 r.p.m. it will develop 60 horsepower under normal conditions.

Report on Engine Tests at the Summer Meeting. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 228-231, 9 figs. Tests were run to bring out (1) decrease in brake mean effective pressure and horsepower with hot-spot manifold, (2) brake economy with hot-spot manifold at full load and at half load with same speeds, (3) flexibility and acceleration of hot spot, and (4) exhaust and intake temperature changes with variations in load and speed.

Four-Wheel-Drive. Development of the Ordnance Four-Wheel-Drive Truck, L. C. Freeman. Jl. Soc. Automotive Engrs., vol. 5, no. 4, Oct. 1919, pp. 281-284 and (discussion) pp. 284-287, 4 figs. Results of continuous tests on all the best-known makes of four-wheel-drive vehicle built in the United States and of the French Latil and Renault tractors. Notes on preparation of specifications; determination of gear ratios; universal joints for driving, etc. It is believed that four-wheel-drive truck will compete successfully in certain application not only with track layer but also with the heavier sizes, at least, of rear-drive trucks.

Frames. Two-ton Truck has Novel Frame Construction. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, p. 717, 3 figs. Channel steel frame employed in Lorain serves chiefly to hold axles in alignment and pay load is carried on wood sills fitted outside steel members and is centered over rear springs.

Fuel Feed. Underpressure Fuel Feed for Auto Trucks (Die Unterdruck-Brennstoffföderung für Lastkraftwagen), E. Jaenichen. Motorwagen, vol. 22, no. 24, Aug. 31, 1919, pp. 439-444, 6 figs. Details of design. Special advantage said to be that they may be installed at any time.

Garner. The 30 Cwt. Garner. Motor Traction, vol. 30, no. 798, June 14, 1920, pp. 582-584, 10 figs. Specifications: Engine, 4-cylinder Continental, 3¾-in. by 5-in., thermo-siphon cooling, 4-bladed fan; ignition, North-East dynamo and battery; clutch, multi-plate dry disk; gasoline, 14 gal. tank on dashboard; tires, 36-in. by 3½-in., single solid fronts; wheelbase, 11 ft. 6 in.; track, 4 ft. 9 in.; overall

length, 17 ft. 2 in.; body space, 13 ft. 6 in., etc.

Gasoline-Electric. The Most Important Features of Modern Electric Automobile Construction (Das Wichtigste über den neuzeitlichen Elektromobilbau), H. Wintermeyer. Elektrotechnischer Anzeiger, vol. 37, no. 51-52, Mar. 31, 1920, pp. 227-228, 2 figs. Details of the Hansa-Lloyd 5-ton truck with single motor, the NAG truck with two motors, the Electro-Daimler fire trucks of the Berlin Fire Department, etc. Examples of gasoline-electric motor trucks.

German. Analysis of German Trucks by the Motor Transport Corps, W. E. Noakes. Automotive Industries, vol. 42, nos. 15 and 23, Apr. 8 and June 3, 1920, pp. 852-853, 1250-1252, and vol. 43, no. 5, July 29, 1920, pp. 206-208, 4 figs. Apr. 8: Details of Audi engine, a four-cylinder L-head type with intake in head, 3 9/16 by 5½ in., with four-point suspension by upper half of crankcase. June 3: The Arbenz engine, a four-cylinder, 4⅛ by 6 in. bore and stroke, 4-point suspension by upper half of crankcase; it is said that good judgment has been shown in designing this type in regard to service, as all parts are accessible. July 29: Description of the Benz, a four-cylinder engine. Report on trucks surrendered to A. E. F. under terms of armistice.

Analysis of German Trucks by the Motor Transport Corps, C. R. Hays. Automotive Industries, vol. 42, nos. 4, 5, 6, 7, 8, 9 and 10, Jan. 22, 29, Feb. 5, 12, 19, 26 and Mar. 4, 1920, pp. 306-309, 354-355, 403-404, 454-457, 510-511, 560-561 and 604-606, 4 figs. Jan. 22: Specifications of Saurer and Vomag. Jan. 29: Investigations and tests on Opel truck. Feb. 5: Data on Hercules truck. Feb. 12: Characteristics of Hering and Nacke types. Feb. 19: Specifications of Dux type. Motor is four-cylinder, L-head, cast en bloc, 4 3/8-in. by 5½-in. bore and stroke, four-point suspension, suspension by upper half of case, arms extending and fastening onto frame of truck. Feb. 26: The Horch machine. Engine has four cylinders, L-head, cast in pairs, 5 1.8-in. by 6¼-in. bore and stroke, four-point suspension, suspension by upper half of crankcase. Mar. 4: Investigations and tests of Durkopp model. Report on trucks surrendered to A. E. F. under terms of armistice.

Tests of German Trucks by Motor Transport Corps, C. R. Hays. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 62-69, 4 figs. Characteristics of following types: Mulag, Hansa-Lloyd, Graff & Stift, and Komnick.

The Büssing 3-Ton Motor Truck (Der 3-t-Kardan-Lastkraftwagen von H. Büssing in Braunschweig), A. Heller. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 47, Nov. 22, 1919, pp. 1161-1168, 31 figs. Details and illustrations of various parts of chassis of 4-cylinder truck designed and constructed by H. Büssing, of Brunswick, to be used for a large number of motor omnibuses in Berlin.

See also Buessing.

Halley. Military Transport Chassis. Automobile Engr., vol. 10, no. 138, May 1920, pp. 179-182, 5 figs. Performance of Halley type "G" chassis under war conditions.

The Six-Cylinder 3½-Ton Halley. Motor Traction, vol. 30, no. 776, Jan. 14, 1920, pp. 25-27, 7 figs. Specifications: Engine, 35 hp., 6 cylinders, 89x154 mm.; regulation, magneto; lubrication, pump; speeds, four; full floating rear axle.

Hydraulic Hoists for. A Hydraulic Hoist for Motor Trucks. Coal Trade Jl., vol. 50, no. 50, Dec. 10, 1919, pp. 1425-1426, 2 figs. Consists of two vertical cylinders containing pistons which are driven by gearing pump. Power to drive pump is taken from extended countershaft on unit power plant type of transmission.

Lancia. The 2½ Ton Lancia. Motor Traction, vol. 30, no. 795, May 24, 1920, pp. 510-512, 12 figs. Dimensions: Wheelbase, 11 ft. 1½ in.; track, 4 ft. 8½ in.; dash to end of frame, 11 ft. 6½ in., and overall length, 17 ft. 1 in.

Leyland W.O. Chassis. Military Transport Chassis. Automobile Engr., vol. 9, no. 133, Dec. 1919, pp. 433-437, 10 figs. Performance of Leyland W.O. chassis under war conditions.

Military. See Ammunition Transport; British War Models; Halley; Leyland; Quad Type; U. S. Army; War Uses; AUTOMOBILES, Uses in War.

Municipal Service, English Types for. Types of Motor Trucks in Use by the Municipalities in England, M. W. Bourdon. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1200-1202, 8 figs. Types of fire engines, street cleaners, tipping bodies and other machines.

New York Show. New York Truck Show. Commercial Vehicle, vol. 21, no. 12, Jan. 15, 1920, pp. 486-497 and 504-507, 27 figs. Attention is called to greatly increased number of vehicles shown mounting on pneumatic tires. Notable developments of parts and accessory equipment are illustrated.

1920 Trucks, Data on. Detailed Technical Specifications of Gasoline Motor Trucks for 1920. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 138-155. Details of 516 gasoline and 22 electric chassis as produced by 208 American manufacturers. Particulars of types and makes of principal truck parts, including engines, clutches, gear-sets, rear axles, steering gears, governors and also electric and fuel systems.

Oil Tanks. Oil-Tank Truck Specifications, F. A. Bean. Power Wagon, no. 191, Oct. 1920, pp. 33-35 and p. 66. Specifications suggested by writer, who is consulting engineer, Wayne Oil Tank & Pump Co.

Operating Costs on Paved Highways. Relation of Highways to Motor Truck Operating Cost, Arthur H. Blanchard. Can. Engr., vol. 38, no. 12, Mar. 18, 1920, pp. 311-313. Results of tests carried out by White Co., Cleveland, are said to have established that on concrete and brick pavements it was practicable to operate loaded 2-ton motor truck for average of 11.5 miles on one gallon of gasoline whereas on average earth road only 5.8 miles to gallon was obtainable.

Operating Cost vs. Road Conditions. Heavy Motor Vehicles in Relation to Roads, W. D. Williamson. Engineer, vol. 128, no. 3338, Dec. 19, 1919, pp. 608-610. Figures are presented which show effect of roads on running cost of vehicles. Paper read before Roads & Transport Congress.

Pierce-Arrow. A New Line of Pierce-Arrow Motor Trucks, P. M. Heldt. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 510-518, 14 figs. Three models, 2-ton, 3½-ton and 5-ton. Engine is built in two sizes, 43 hp. for 2-ton model and 63 hp. for both 3½-ton and 5-ton models. Provision is made for pneumatic tires in two smaller models.

Pneumatic-Tires. Air Has Advantage in Tire Tests. Power Wagon, vol. 24, no. 184, Mar. 1920, pp. 27-28. Statistics of Goodyear's Akron-to-Cleveland motor-truck service, showing comparison in various ways between air and solid tires on seven trucks over period of one year. Predicts that solid tires may be obsolete within few years.

Data on Pneumatic Tires and Rims Used on Trucks, Burgess Darrow. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 366-368, 7 figs. Constructional details of standard pneumatic tires.

Design of Pneumatic-Tired Trucks, C. M. McCreery. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 87-98, 17 figs. Changes which are visualized over present solid-tire design are: Higher rear-axle gear-reductions, about 15 per cent increase in engine sizes, lower transmission low-gear reductions, lighter unsprung parts, and multiple-wheel construction to accommodate heavier tonnage.

Equipment Design for Use on the Pneumatic Tired Truck, J. Edward Schipper. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1152-1153. Modifications which will be introduced in design of engines, gear sets, rear axles, tires and wheels of a pneumatic tired truck.

Packard Adapts Three Truck Models to Pneumatic Tires, J. Edward Schipper. Automotive Industries, vol. 42, no. 10, Mar. 4, 1920, pp. 596-601, 11 figs. Details and illustrations of new Packard model Y, designed for maximum weight of 8000 lb. above chassis, including body and load. Two other new pneumatic-tired trucks are described.

Pneumatic-Tire and Motor-Truck Development Experiences, M. D. Scott. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 375-377. Experience of Goodyear Tire & Rubber Co., Akron, O. Data given in regard to costs, efficiency, and loading capacity of motor trucks equipped with pneumatic tires.

What Motor Trucks Need to Supplement Pneumatic-Tire Equipment, E. W. Templin. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 369-374 and 398, 12 figs. Changes in design consequent upon adoption of pneumatic tires for motor trucks.

Why Use Pneumatic Tires for Motor Trucks, W. E. Shively. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 363-365 and (discussion) pp. 377-384. Advantages gained from use of pneumatic tires.

Pneumatic vs. Solid Tires. Relation of Solid and Pneumatic Tires to Motor-Truck Efficiency, S. V. Norton. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 208-214. Factors considered are those involved in engineering design and those resulting from practical limitations by reason of requirements of service. Opinion is expressed that in spite of present progress, question of using pneumatic tires on trucks should not overshadow study of other means than tires to develop cushion effects.

Tests Reveal Relative Values of Pneumatic and Solid Tires, Alfred F. Masury. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 668-670, 2 figs. Motion-picture studies made by International Motor Co. It is concluded that impact of truck striking ground after bounding over an obstruction is increased approximately as square of speed and as weight; but inversely as resiliency of springs and tires. Tests are described in detail and it is seen, for example, in one case, that pneumatic saved road two-thirds "grief" and vehicle itself one-fourth.

Quad Type. Building "Quad" Trucks for the Army, Harry Satterthwaite. Am. Mach., vol. 52, no. 10, March 4, 1920, pp. 509-513, 15 figs. "Quad" type is intermediate between those of standard trucks and of tractors. Article describes progressive assembly of chassis and also several machining operations on chassis parts.

Scammell. The Scammell Chassis. Automobile Engr., vol. 10, no. 140, July 1920, pp. 268-271, 10 figs. Interesting features of a British design embodying low chassis weight with carrying capacity as high as 7½ tons.

The Scammell Tractor-Lorry. Motor Traction, vol. 30, no. 781, Feb. 16, 1920, pp. 148-152, 13 figs. Six-wheeled transport vehicle for useful loads of eight tons.

Six-Wheeled. A Six-Wheeled Truck with Tandem Rear Axle Drive, E. W. Templin. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1363-1367, 7 figs. Instead of usual rear construction, four wheels and two axles are employed with tandem drive. Specifications: Carrying capacity, 5 tons; wheelbase, 180 in.; tires, 40 by 8 in. pneumatic all around; engine, Hercules model T3, 5-in. bore, 6-in. stroke, 4 cylinders; horsepower rating, 40; torque, 3200 in.-lb. at 1200 r.p.m., etc.

Specifications. Internal-Combustion Truck Specifications. Power Wagon, vol. 24, no. 190, Sept. 1920, pp. 30-47. Table giving dimensions of engine, make of carburetor, kind of transmission, and other particulars of 570 types.

Springs and Tires, Tests of. Jump Tests Show Action of Truck Springs and Tires, Alfred F. Masury. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920. pp. 514-516. Experiment by International Motor Co. employing motion picture for close study of motion of parts when passing over obstructions and striking earth.

Standardization. Uniform Dimensions Would Reduce Truck Building Costs, J. Edward Schipper. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1323-1325 and 1347, 4 figs. It is pointed out that standardization of truck practice is vital need in industry today, and writer suggests a few possible uniform dimensions relating to mounting of body or cab and to arrangements for power take-off.

Storage-Battery. See Electric.

Tests. A Study of Road Impact and Spring and Tire Deflection, A. F. Masury. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 96-98 and (discussion), pp. 98-102. Account of tests performed with various models of motor trucks to determine effect of different spring and tire equipment on impact and effect of unsprung weight upon road impact, as well as effect of varying speed on these impacts.

Tires. See Pneumatic Tires; Springs and Tires.

Titan. Titan 2½-Tonner Designed for Dump Body Work. Commercial Vehicle, vol. 22, no. 3, Mar. 1, 1920, pp. 98-99, 1 fig. Specifications: Capacity, 2½ tons; price, $3,400; wheelbase, 156 in.; front tires 34 by 4; rear tires, 36 by 4 dual; bore 4¼ in.; stroke, 5½ in.; N. A. C. C. hp., 29; speed r.p.m., 1100; speed m.p.h., 17; gear ratio in high gear, 8 to 1; final drive, int. gear.

Trailers. Chicago's Trial Trailer Completed. Elec. Ry. Jl., vol. 56, no. 3, July 17, 1920, pp. 110-114, 6 figs. Description of new trailer weighing 26,000 lb. and seating 62 persons; reconstruction of motor car for trailer operation.

Trailers Facilitate Heavy Haulage, Donald McLeod Lay. Iron Age, vol. 106, no. 6, Aug. 5, 1920, pp. 311-314, 5 figs. Among advantages of trailers for transporting long girders and beams are quoted better distribution of loads with less road wear and lower operation costs.

See also TRAILERS, Folding Camp.

Transmission Gears. Gear Teeth Sizes from the Standpoint of Durability, Joseph Jandasek. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1402-1406, 4 figs. It is claimed that calculations of gear teeth should be based on resistance of wear of teeth and not, as is customary, on breaking strength of teeth.

Transmissions for. Power Transmission Groups of the German Trucks, Arthur J. Slade. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 666-669, 12 figs. Transmission group described consists of clutch, gear box and service brake, which in majority of instances are compactly assembled.

Types for Special Purposes. Modern Motor-Truck Types for Special Purposes (Moderne

Lastwagentypen für besondere Zwecke), Albert Neuburger. Allgemeine Automobil-Zeitung, vol. 21, no. 8, Feb. 21, 1920, pp. 21-22, 5 figs. Details of a brick transportation truck of the Mannesmann Mulag Motor Truck Corp. and the H. Büssing truck, both constructed with a view to reducing time of loading and unloading; a new type of truck for transportation of alcohol and a truck for transportation of implements, both of the Nat. Automobile Corp.

U. S. Army. Army Motor-Transport Vehicles, John Younger. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 859-863 and 892, 9 figs. Motor-transport vehicles have been classified by Army under ten broad heads, ranging from motor cycles to 5-ton trucks, and such classification is said to have been found to be most satisfactory. Writer discusses various vehicles from viewpoint of convenience of standardizing single type of vehicle for each class. He observes that once standards have been adopted they should be reasonably adhered to for at least period of 5 years before any serious change is contemplated.

The Army Motor Service, J. M. Ritchie. Jl. Engrs. Club, Philadelphia, vol. 36, no. 180, Nov. 1919, pp. 430-432. Organization of Motor Transport Corps is presented as typifying example of economy to be derived from pooling transportation. Need of good roads and part engineering societies should take in their development are discussed.

Use at Railway Terminals. Better Methods in Railway Cartage. Ry. Gaz., vol. 32, no. 14, April 2, 1920, pp. 519-521, 4 figs. Two systems of utilizing motor trucks in railway terminals in England are described: "demountable body" system used by Midland Railway, and "tractor and semi-trailer" system used by Great Western Railway.

Removable Truck Bodies Save Labor, B. F. Fitch. Iron Trade Rev., vol. 66, no. 13, Mar. 25, 1920, pp. 924-925, 3 figs. Experience at Cincinnati Terminal of Big Four railroad.

Use in Marine Terminals. See TERMINALS, MARINE, Tractors and Trailers.

Vibrations, Measurement of. The Measurement of Vehicle Vibrations, Benjamin Liebowitz. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 17-25, 10 figs. Describes seismograph which traces time-displacement curve of point in vehicle body, and shows how from this curve vertical velocities, accelerations, amplitudes, periods and damping of motor truck can be measured.

War Uses. Military Transport Chassis. Automobile Engr., vol. 10, no. 136, March 1920, pp. 107-111, 7 figs. Performances of Straker-Squire C. F. chassis under war conditions.

Watson. The Watson Chassis. Motor Traction, vol. 30, no. 782, Feb. 23, 1920, pp. 181-182, and 183-184, 9 figs. Engine, 4 cylinders, 115 by 140 mm.; carburetor, Claudel-Hobson; lubrication, forced; drive, internal gear ring and pinion; wheelbase, 13 ft. and 14 ft. 6 in.; capacity of gasoline tank, 21 gal.; useful load, 3½ to 4½ tons.

Wheels. A New Road Wheel. Motor Traction, vol. 31, no. 811, Sept. 13, 1920, p. 261, 4 figs. Patented Pickering wheel. Two rows of spokes are employed, and these are staggered or arranged so that spokes of row on one side alternate with those of other. By tightening action of flanges spokes tend to get forced toward center and are expanded circumferentially outward.

Physical Tests of Motor-Truck Wheels, Charles P. Hoffmann. Technologic Papers Bur. Standards, no. 150, March 17, 1920, 62 pp., 42 figs. Data on radial-compression and side-thrust tests of cast-steel, pressed-steel, wrought-iron, and wooden wheels submitted by motor-truck wheel manufacturers. As general conclusion it is believed that wheels are stronger and heavier than is necessary.

See also Spring Wheels.

MOTOR TRUCKS, MILITARY

See MOTOR TRUCKS, Military.

MOTOR VEHICLES

See AUTOMOBILES; MOTOR BUSES; MOTORCYCLES; MOTOR TRUCKS; PRODUCER GAS, Use by Motor Vehicles; TANKS; TRACTORS.

MOTORS

Electric. See ELECTRIC MOTORS.

MOTORCYCLES

British Show. The British Motorcycle Show, M. W. Bourdon. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 3-10, 35 figs. Account of fifth International Motor Cycle Show which opened at Olympia one week after closing of automobile show. Seventy-six different makes of motor cycles were exhibited in addition to several examples of British three-wheel runabouts.

British Trials. The British Motorcycle Trials, M. W. Bourdon. Automotive Industries, vol. 41, no. 24, Dec. 11, 1919, pp. 1162-1163. Account of official British trial which included various American types.

French Designs. The Recent Development of Motorcycles in France, W. F. Bradley. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1394-1396, 9 figs. Construction features of several of recent French models.

Light-Powered. Light Powered Motorcycle Has Vee Type Engine, P. M. Heldt. Automotive Industries, vol. 41, no. 24, Dec. 11, 1919, pp. 1168-1174, 11 figs. Engine has 2¾ by 3 1/16 in. cylinders giving piston displacement of 36-38 cu. in. It is rated at 5 hp. but it is said to have developed 11 hp. dynamometer tests.

MOTORSHIPS

Afrika. The World's Largest Motorship. Pacific Mar. Rev., vol. 17, no. 6, June 1920, pp. 99-101, 5 figs., 2 on supp. plate. Details and illustrations of twin-screw motorship Afrika, built by Burmeister & Wain of Copenhagen, Denmark, to order of East Asiatic Co. of same. Specifications: Overall length, 464 ft. 6 in.; molded breadth, 60 ft.; molded depth to awning deck, 42 ft.; gross tonnage, 8597 register tons; capacity of hold, about 700,000 cu. ft. of grain; fuel-oil capacity, about 1500 tons; i.hp. 4500.

American. The Oil Engine as a Propelling Medium, J. W. Anderson. Shipping, vol. 9, no. 13, Dec. 31, 1919, pp. 27-28. Reviewing experience of European owners "who are selling their steamships and building motorships" writer advises installing motorships in American merchant vessels now under construction in order to meet competition in ocean freight transportation.

Concrete. World's Largest Concrete Motorship. Motorship, vol. 5, no. 9, Sept. 1920, pp. 800-801. "Cochinchine," propelled by Diesel engines. Dimensions: Deadweight capacity, 2200 tons; length overall, 228 ft.; breadth, moulded, 38 ft.; draft, loaded, 18 ft. 9 in.; power, 1280 i.hp.; trial speed, 10½ knots.

Danish. Recent Danish Motorship Progress. Motorship, vol. 5, no. 3, March 1920, pp. 205-207, 5 figs. General dimensions of two Diesel-driven vessels.

Scandinavian Motor-Coasters and North Sea Traders. Motorship, vol. 5, no. 1, Jan. 1920,

p. 36, 4 figs. Standard Danish 600 hp. Diesel and surface-ignition engined auxiliaries.

The Motor Ship Theodore Roosevelt. Engr., vol. 130, no. 3375, Sept. 3, 1920, p. 236, 1 fig. Built at yard of Burmeister & Wain, Copenhagen. Dimensions: Length overall, 444 ft. 4 in.; breadth on frame, 55 ft.; depth from lower deck, 22 ft. 6 in.; draught, loaded, 29 ft. 1 in.; gross tonnage, 7116 tons; fuel-oil capacity, 1282 tons; radius of action, 30,000 miles.

Diesel-Engined. Bibby Lines Motorships "Dorsetshire" and "Somersetshire." Motorship, vol. 5, no. 10, Oct. 1920, pp. 889, 1 fig. Two new twin-screw Diesel-Driven vessels of 12,000 tons d.w.c. Dimensions: Length between perpendiculars, 450 ft.; breadth, 57 ft. 3 in.; depth, 33 ft. 7 in.; power of main engines, 4500 i.hp.

New Vickers-Engined Motorship. Motorship, vol. 5, no. 7, July 1920, pp. 609-615, 7 figs. Dimensions: Displacement, 14,000 tons; fuel capacity, 750 tons; cruising radius, 68 days; total cargo capacity, 486,000 cu. ft.; length, 425 ft.; breadth, molded, 56 ft. 8 in.; depth, molded, 33 ft.; draft, 26 ft.; contract speed, 10.5 knots; trial speed (on 26 ft., 2 in. draft), 11.24 knots.

The Motor Ship "Narragansett." Eng., vol. 109, no. 2839, May 28, 1920, pp. 716-719 and p. 722, 18 figs. partly on 2 supp. plates. Deadweight capacity, 10,050 tons; draft, 26 ft.; cargo-carrying capacity, 9450 tons. Vessel is oil tanker and contains 10 main-cargo oil tanks divided longitudinally by center bulkhead and fitted with trunk hatches to upper deck, each hatch having a vent pipe.

See also Tankers.

Electric Auxiliaries. Electric Auxiliaries of the "Benowa" Class of Motorships. Motorship, vol. 5, no. 9, Sept. 1920, pp. 801-803, 5 figs. Engine-room and deck equipment as developed by Pacific Coast firm.

Electrically Welded. The Electrically-Welded Ship "Fullagar." Eng., vol. 10, no. 2844, July 2, 1920, pp. 25-26, 14 figs. Dimensions: Length, 150 ft.; beam, 23 ft. 9 in.; depth, main deck, 11 ft. 6 in.; draft, 11 ft. 4 in.; deadweight, 500 tons, cargo capacity, 25,200 cu. ft.; speed, 9½ knots to 10 knots. Welding was carried out by quasi-arc system. Tests at sea are said to have proven motorship to be entirely satisfactory.

French. Naval and Merchant Motorship and Oil Engine Development in France. Motorship, vol. 4, no. 12, Dec. 1919, pp. 18-27, 19 figs. There is total of 20,896 shaft hp. in 51 Diesel engines, of which 5 motors are of four-cycle type and 46 engines of two-cycle type. Details of 5 vessels fitted with Normand engines are given in article.

Fuel Economy. Saving in Fuel Bill on Oil-Engined Vessels. Engineering, vol. 108, no. 2810, Nov. 7, 1919, p. 615, 1 fig. Chart showing comparison of fuel consumption for 300-brake horsepower Bolinder hot-bulb oil engine and 300-hp. compound condensing steam set.

Italian. Motor Ship "Ansaldo S. Giorgio" (Motonave da carico "Ansaldo S. Giorgio"). Ingegneria Italiana, vol. 4, no. 91, Oct. 2, 1919, pp. 158-162, 4 figs. Characteristics are: Length between perpendiculars, 378 ft.; breadth, 50 ft.; draft, 24 ft.; tonnage, 8000. It is operated by two 2200-hp. Diesel engines.

Machinery for. Review of Motorship Machinery Problems, Hubert C. Verhey. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 830-832. Opposed piston-type engines. Novel scavenging pumps. Engine-room arrangements and auxiliaries. Diesel-electric drive.

Review of Problems Involved in the Production of Motorship Machinery, Hubert C. Verhey. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 667-671. Paper takes up such questions as crankshaft troubles, relative merits of four- and two-cycle motors, compressors and drainage system for air compressors, and matters relating to installation.

Oil Tankers. New Anglo-American Oil Tanker. Gas & Oil Power, vol. 15, no. 177, June 3, 1920, p. 150, 1 fig. Account of trials of the M.S. Narragansett. Specifications: Length B.P., 425 ft.; breadth, 56 ft. 8 in.; total deadweight capacity, 10,050 tons; bunker capacity (oil), 733 tons.

Performance. What a Pioneer Motorship Has Done, Charles W. Geiger. Oil News, vol. 8, no. 6, Feb. 20, 1920, pp. 19-20. The Siam, a 10,000-ton vessel fitted with eight-cylinder sets of 1575 i.hp., is said to have given no trouble in five years of service.

Salerno. The New 6500 Tons D.W.C. Motorship "Salerno." Motorship, vol. 5, no. 6, June 1920, pp. 520-525, 6 figs. Description and illustrations of Werkspoor Diesel-engined freighter built in Holland for Norwegian owners, with 2800 hp. in a 40-ft. engine room.

Standardization. Motorships Being Standardized in Europe. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 757-758, 2 figs. Vessels of standard types nearing completion in Denmark and Sweden.

Steamships vs. Cargo Motorships vs. Steamships Charles E. Lucke. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 837-841. Fixed annual expenses and service expenses. Cost of cargo transportation, net earnings and investment returns.

Motorships vs. Steamships, Charles E. Lucke. Motorship, vol. 5, nos. 9 and 10, Sept. and Oct. 1920, pp. 819-823 and 910. Comparative operating expenses and earnings of cargo vessels.

See also SHIPS, Cargo Motorships vs. Steamships.

Tankers. Another All-American Full-Diesel-Engined Tanker. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 62-63, 1 fig. Specifications: Length, 330 ft.; beam, 46 ft.; molded depth, 27 ft.; deadweight capacity, 5010 tons.

Another Hudson-Built Steel Motor Tanker. Motorship, vol. 5, no. 2, Feb. 1920, pp. 117-118, 3 figs. Dimensions: Length overall, 216 ft. 7 in.; molded breadth, 35 ft. 6 in.; molded depth, 17 ft. 4 in.; main engine power, 500 shaft hp.; dead weight, 750 tons.

Standard Oil Company's New Motor Tankers. Motorship, vol. 5, no. 4, April 1920, pp. 295-297, 3 figs. Two Diesel-driven ships now building on Pacific Coast. One of these is said to show gain of $157,350 over annual earning power of sister oil-fired steamer "El Segundo."

Texas Company's New Motorship. Motorship, vol. 5, no. 6, June 1920, pp. 509-516, 13 figs. Description and illustrations of Solitaire, a McIntosh & Seymour Diesel-engined bulk-gasoline tanker of 6730 tons' displacement.

Zoppot. Biggest Motorship in the World Arrives at New York. Motorship, vol. 5, no. 9, Sept. 1920, pp. 796-799. Krupp-built 17,000 tons d.w.c. Diesel-driven tanker. Dimensions: Length between perpendiculars, 525 ft.; draught, 27 ft. 9 in.; power, 4000 i.hp.; screw, twin type of engine; two-cycle; speed, loaded, 11½ knots; daily fuel consumption, 12 to 13 tons.

MOUNTAINS

Abajo, Utah. Structural Features of the Abajo Mountains, Utah, Malcolm Rutherford Thorpe. Am. Jl. Sci., vol. 48, no. 287, Nov. 1919, pp. 379-389, 4 figs. Mountains comprise group of laccoliths with associated sheets and dikes.

MUNICIPAL CONTRACTS

Cost-Plus. See CONTRACTS, Cost-Plus.

MUNICIPAL IMPROVEMENTS

Risks in Untried Processes. What Risks Should Cities Take in Installing Relatively Untried Processes? Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 132-135. Letters from consulting engineers, municipal engineers and engineers of state departments of health, particularly in reference to drifting sand filters and electrolytic process of sewage treatment.

MUNICIPAL OWNERSHIP

Street Railways. See STREET RAILWAYS, Municipal Ownership.

MUNITIONS

Production. Tabular List of Domestic and Foreign Patents Issued During the War for Production of Munition and Explosives (Tabellarische Uebersicht über die während des Krieges auf dem Gebiete des Schiess- und Sprengstoffwesens erschienenen In- und Auslandspatente). Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 15, nos. 4, 5 and 6, Feb. 1 and Mar. 1 and 11, 1920, pp. 51-53, 66-68 and 76-79.

MUSTARD GAS

See GAS WARFARE, Mustard Gas.

N

NAPHTHALENE

Manufacture. Modern Technique of the Coal Tar Industry (La technique moderne de l'industrie des goudrons de houille), M. C. Berthelot. Revue de Métallurgie, vol. 17, no. 5, May 1920, pp. 335-350, 6 figs. Manufacture of pure naphthalene and anthracene.

Removal from Gas. Naphthalene (Einiges über Naphthalin), Karl Bunte. Jl. für Gasbeleuchtung u. Wasserversorgung, vol. 63, no. 12, Mar. 20, 1920, pp. 181-183, 1 fig. Notes on naphthalene formation and its removal from gas by cooling; cause and elimination of naphthalene obstructions, for which use of xylene evaporation during the first warm days of year is recommended.

Solidification Point. A Standardized Method for the Determination of Solidification Points, Especially of Naphthalene and Paraffin, R. M. Wilhelm and J. L. Finkelstein. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 340, Sept. 12, 1919, pp. 185-197, 4 figs. Method recommended at conference at Bur. of Standards and United States customs officials and adopted by U. S. Customs Service for determination of solidification point of naphthalene.

NATALITE

See AUTOMOBILE FUELS, Natalite.

NATIONAL DEFENSE

United States. The United States in the Next War, Johnson Hagood. Jl. U. S. Artillery, vol. 53, no. 1, July 1920, pp. 1-8. Experience of war is believed to emphasize that best policy for national defense for United States lies in a strong navy with principal harbors strongly fortified.

NATIONAL DEPARTMENT OF PUBLIC WORKS

See PUBLIC WORKS, National Department of.

NATIONAL SCREW THREAD COMMISSION

See SCREW THREADS, National Screw Thread Commission.

NATURAL GAS

Carbon Black from. See CARBON BLACK.

Casing-Head. Valuation Factors of Casing-Head Gas Industry, Oliver U. Bradley. Min. & Metallurgy, no. 164, Aug. 1920, pp. 27-28. Most important factors are said to be quantity of gas available and conditions that will have material bearing on its future supply, such as location of field, depth of oil wells, initial rock pressure, thickness and porosity of oil sands, relative position of oil and gas strata in sand, grade of oil, life of oil wells, location and rapidity of water infiltration, vacuum carried, and regularity of its application. (Abstract.)

Conservation of. Conservation of Gas, L. B. Denning. Natural Gas & Gasoline Jl., vol. 14, no. 9, Sept. 1920, pp. 261-262. Work done by National Committee on Natural Gas Conservation, which consists of four representatives of public, four representatives of gas-producing companies, and two representatives of Dept. of Interior. Set of rules and regulations drawn up by committee is given.

Efficiency in Cooking. Efficiency of Natural Gas Used in Domestic Service, Robert F. Earhart. Mech. Eng., vol. 42, no. 5, May 1920, pp. 287-288 and 316, 4 figs. Results of tests on commercial burners under kitchen conditions, showing effect of gas pressure and distance between burner and vessel on the efficiency.

Extinguishing Fire at Well. Explosives Used to Snuff Out Largest Gas Well Fire Ever Known, After All Other Methods Failed. Am. Gas Eng. Jl., vol. 112, no. 9, Feb. 28, 1920, pp. 164 and 167, 1 fig. Package containing explosives and covered by asbestos sheetings was rapidly pulled by steel cable running through two derricks and exploded at edge of fire. This stopped fire by temporarily checking flow of gas.

Extinguishing a Burning Gas Well, Seth S. Langley. Eng. & Min. Jl., vol. 108, no. 21, Dec. 6, 1919, pp. 871, 1 fig. Exploding of nitroglycerine, in conjunction with use of steam, water and slime, said to have proven successful.

Gasoline from. See GASOLINE, Natural-Gas.

Gasoline Removal, Effect of. Effects of Gasoline Removal on the Heating Value of Natural Gas, Donald B. Dow. Dept. of Interior, Bur. of Mines, technical paper 253, 1920, 23 pp., 2 figs. Loss in B.t.u. value in "dry gas" ordinarily supplied to domestic consumer was found to be about 2 per cent after gasoline vapor had been removed, but for "casing-head" gas percentage loss was found to be larger.

Industry in U. S. U. S. Natural Gas Production, E. G. Sievers. Gas Rec., vol. 17, no. 10, May 26, 1920, pp. 51-54. Situation of natural gas industry. Number of producing wells has increased 135 per cent since 1906, and was about 40,500 at end of 1918. About 76 per cent of production is not consumed where produced but is piped to other states. United States produces about 95 per cent of natural gas produced in the world.

Kansas and Oklahoma. A Chemical Survey of the Natural Gases of Kansas and Oklahoma, H. C. Allen and E. E. Lyder. Bul. of University of Kansas, vol. 19, no. 1, Jan. 1, 1918, 101 pp., 10 figs. It is shown that gases of Mid-Continental field vary between wide limits—99 per

cent to 10 per cent—as to percentage of hydrocarbons and nitrogen present, and consequently in heating values. Maximum percentage of carbon dioxide found was slightly over 4 per cent. Shallower gases were found to be poorer in quality than deeper ones in the same locality.

Montana. See Petroleum, Huntley Field, Montana.

Pipe Lines. See PIPE LINES, Natural Gas Transportation.

Production in U. S. Official Natural Gas Data, E. G. Sievers. Gas Age, vol. 45, no. 12, June 25, 1920, pp. 534-539, 10 figs. Preliminary report on natural gas production and consumption issued by U. S. Geol. Survey, in which it is stated that United States produces about 95 per cent of natural gas produced in world and thus has monopoly of this resource.

Utilization and Conservation. Mud Process in Saving Gas, A. W. Ambrose. Gas Rec., vol. 18, no. 6, Sept. 22, 1920, pp. 31-33. Method of preventing waste while drilling for gas and oil.

NAVAL AIRCRAFT

See AIRCRAFT, U. S. Navy; RADIO COMMUNICATION, Naval Aircraft.

NAVIGATION

Distances, Determination of. Apparatus for the Determination of Distances at Sea (Vorrichtung zur Ermittlung von Entfernungen auf See). Elektrotechnischer Anzeiger, vol. 36, nos. 121 and 122, Oct. 29 and 30, 1919, pp. 574 and 578-579, 5 figs. Description and illustration of a clock invented by Dr. Schiessler of Vienna.

Floating Mines. Drifting of Floating Mines in the Atlantic Ocean (Les mines errantes sur l'Atlantique nord), Albert de Monaco. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 13, March 29, 1920, pp. 778-782, 1 fig. In Comptes rendus, vol. 167, p. 1049, laws formulated by writer in regard to possible travel of drifting mines were given and safe routes for ships to follow were pointed out. In present note, reports of Hydrographic Bureau of Washington are shown to confirm laws previously stated.

Inland. See Monongahela River, W. Va.; Rhone-Rhine.

Monongahela River, W. Va. Monongahela River Navigation, H. W. Stickle. Prof. Memoirs, Corps of Engrs. U. S. Army & Engr. Dept. at Large, vol. 11, no. 60, Nov.-Dec. 1919, pp. 695-713, 5 figs. River taps West Virginia bituminous-coal region which is said to be richest in the world. Existing project provides for improvement of river by 15 locks and dams to afford slack-water navigation from Pittsburgh to four miles above Fairmont, W. Va., a distance of 130 miles.

Radio Compass. The Prospective Utilization of Vessel-to-Shore Radio-Compass Bearings in Aerial and Transoceanic Navigation, G. W. Littlehales. Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 38-44, 3 figs. Method is described for finding altitude and longitude in aerial and marine navigation from vessel-to-shore radio-compass bearings, and theory is explained upon which such method is based.

Rhone-Rhine. The Swiss Rhone-Rhine Navigation, A. Wharton Metcalfe. Engr., vol. 129, nos. 3351 and 3353, Mar. 19 and Apr. 2, 1920, pp. 290-291, 2 figs., and 341-342, 1 fig. Rhone-Lake of Geneva junction section. Apr. 2: Lake of Neuchatel and Rhine junction section.

Shoal-Water Warning. The Sperry Ship's Log, R. E. Kortepeter. Sperryscope, vol. 1, no. 12, Apr. 1920, pp. 1-4 and 15, 7 figs. Speed and distance indicating instrument that gives shoal-water warning.

Siemens Helm Indicator. Siemens Electric Helm Indicator. Steamship, vol. 31, no. 369, March 1920, pp. 203-204, 4 figs. Apparatus designed to indicate angle of ship's rudder on navigating bridge. Method of coupling switch to rudder post is indicated.

Submarines, Navigational Obligations. Modern Marine Problems in War and Peace, C. V. Drysdale. Jl. Instn. Elec. Engrs., vol. 58, no. 293, July 1920, pp. 572-597. Account of scientific investigations which have been carried out in marine problems during and after the war under British Admiralty at various experimental stations. Work during war consisted chiefly of devising means for detecting submarines. Eleventh Kelvin Lecture.

Towing Spar, Use in. An Improved Towing Spar which can be Used as a Navigational Instrument, S. F. Heim. U. S. Naval Inst. Proc., vol. 46, no. 205, March 1920, pp. 375-377, 2 figs. Scheme for taking sights by bringing image of heavenly body to spar towed by ship.

Traverse Diagram. A Traverse Diagram, L. V. Kielhorn. U. S. Naval Inst. Proc., vol. 46, no. 205, March 1920, pp. 361-363, 2 figs. Designed to supplant to some degree Bowditch's traverse tables.

[See also RADIO COMMUNICATION, Guiding Aerial and Marine Craft; SHIPS, Guiding by Acoustic and Electric Signals; SUBMARINE SIGNALS.]

NAVY YARDS

New Orleans, War Work of. The Navy Yard at New Orleans, Fred H. Colvin. Am. Mach., vol. 52, no. 21, May 20, 1920, pp. 1073-1075, 8 figs. Work done during the war.

NEEDLES

Sewing-Machine. Manufacture of Sewing Machine Needles, Carlos Ruiz. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 834-836, 3 figs.; also Machy. (Lond.), vol. 16, no. 401, June 3, 1920, pp. 267-269, 3 figs. Brief outline of general procedure in manufacture of sewing-machine needles and description of turret machine used in connection with performance of fourth, fifth and sixth operations, there being fifteen operations required in all which are shown diagrammatically.

NEON

Constitution of. The Constitution of Atmospheric Neon, F. W. Aston. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 232, April 1920, pp. 449-455. Facts are quoted which are interpreted that atmospheric neon may be mixture of isotopes. Results of attempts of separation are summarized.

Spectra. See SPECTRA, Krypton and Neon.

NEPHELOMETER

See CHLORINE, Determination.

NEW YORK STATE BARGE CANAL

See CANALS, New York State Barge.

NICHROME

Castings for Heat Treatment. Nichrome Castings for Heat Treatment. Proc. Steel Treating Research Soc., vol. 2, no. 8, 1919, pp. 34-38. Nichrome, which is an alloy composed of 60 per cent nickel, remainder being principally chromium, is used for annealing and carbonizing boxes, heating retorts, cyanide hardening pots, etc. Its advantage over other materials is said to be that it avoids cracking, growing, scaling, warping, change of form, corrosion or reduction of strength.

[See also ALLOYS, Heat-Resisting.]

NICKEL

Nickel Brass. See BRASS, Nickel.

Production in U. S. See MINERALS, Production in U. S.

Rolled Shapes. Rolled Products of 99 Per Cent Nickel, Edwin F. Cone. Iron Age, vol. 105, no. 25, June 17, 1920, pp. 1713-1716, 9 figs. Open-hearth treatment which makes possible rolling of same shapes now produced in mild steel.

Uses. Metallurgy and Uses of Nickel (Le nickel, sa métallurgie, ses emplois), Léon Guillet. Génie Civil, vol. 75, nos. 23 and 24, Dec. 6 and 13, 1919, pp. 565-569, 5 figs., and pp. 590-593. Composition and properties of nickel and copper steels. Ternary alloys of copper, nickel and zinc; table giving electric resistance of various nickel alloys.

NICKEL ALLOYS

Copper-Nickel, Magnetic Properties. The Magnetic Properties of Nickel-Copper Alloys (Die magnetischen Eigenschaften von Nickel-Kupfer-Legierungen), R. Gans and A. Fonseca. Annalen der Physik, vol. 61, no. 8, May 4, 1920, pp. 742-752, 5 figs. In opposition to the Tammann rule, it is concluded that ferromagnetic crystals dissolved in unmagnetic crystals can form ferromagnetic alloys. Results obtained coincide with the behavior of the Co-Cu alloys with single exception that the break in the series of the mixed crystals is considerably greater in these. Report from Physical Inst. of La Plata, Argentine.

Iron-Nickel. See IRON-NICKEL ALLOYS.

Monel Metal. See MONEL METAL.

Nichrome. See NICHROME.

Nickel-Chromium. See ALLOYS, Nickel-Chromium.

Nickel-Chromium-Iron. See ALLOYS, Heat-Resisting.

Nickel-Iron. Some Physical Properties of Nickel-Iron Alloys, L. R. Ingersoll. Physical Rev., vol. 16, no. 2, Aug. 1920, pp. 126-132, 4 figs. Values determined for specific heats, thermal conductivities, thermoelectric powers, and specific resistances of iron-nickel alloys varying in per cent of nickel from zero to 100.

The Constitution of the Nickel Iron Alloys, D. Hanson and Hilda E. Hanson. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 5, 20 pp., 31 figs. Investigation into constitution of nickel-iron alloys. Special attention was given to determination of effect of small quantities of nickel on critical points of pure iron. Osmond's theory of nickel-iron alloys is examined, and attempt is made to construct "stable" diagram of nickel-iron alloys.

NICKEL-CHROME STEEL

See CHROME-NICKEL STEEL.

NICKEL-COPPER STEEL

Production. Nickel-Copper Steel, R. W. Leonard. Trans. Eng. Inst. of Canada, vol. 32, part 2, Jan. to June 1918, pp. 361-390, 15 figs. Laboratory experiments in production of nickel-copper steel direct from Sudbury ores, made by George M. Colvocoresses. Patented process evolved from results of these experiments.

NICKEL METALLURGY

Practices. Metallurgy and Uses of Nickel (Le nickel, sa métallurgie, ses emplois), Léon Guillet. Génie Civil, vol. 75, no. 20, 21 and 22, Nov. 15, 22 and 29, 1919, pp. 473-481, 507-510 and 532-535, 16 figs. Metallurgical practices at garnierite mines of New Caledonia and at mines of Canadian Copper Co. are compared. Electrometallurgy of nickel by wet process. Characteristic properties of various nickel alloys.

Refining. See also BLAST FURNACES, Turbo-Blower for.

Smelting. The Mining and Smelting Operations of the International Nickel Company of Canada, Limited. Monthly Bul. Can. Inst. Min. & Metallurgy, no. 100, Aug. 1920, pp. 614-654, 30 figs. Method of treating ore, including roasting, smelting in blast furnace or reverberatory, and converting matter in basic converters. Detailed account of operations is given, together with description of machinery.

See also NICKEL, Uses.

NICKEL ORE

Mining. Nickel Ore Mining in Sudbury District, W. L. Wotherspoon. Can. Min. Jl., vol. 41, no. 6, Feb. 13, 1920, pp. 118-122, 4 figs. Historical survey.

[See also IRON ORE, Nickel Content.]

NICKEL PLATING

See ALUMINUM, Nickel Plating; ALUMINUM ALLOYS, Nickel Plating.

NICKEL STEEL

Commercial. Critical Ranges of Some Commercial Nickel Steels, Howard Scott. Sci. Papers of Bur. of Standards, no. 376, April 6, 1920, pp. 195-214, 11 figs. Survey of work undertaken by different investigators and results of experimental work. It was found that critical range Ar_3 on cooling iron-nickel alloys is lowered nearly linearly to absolute zero for about 34 per cent nickel, and critical range Ar_1 and Ar′ of pearlitic nickel steels is lowered with increasing nickel content until region of complete martensitization is reached, when transformation Ar″ alone is found at much lower temperature. Critical ranges were determined for six commercial nickel steels of 0.30 to 0.40 per cent C, 0.55 to 0.75 per cent Mn, 0.15 to 0.30 per cent Si contents, and nickel varying from 0 to 3.5 per cent, together with pure iron-carbon alloy of 0.40 per cent C content.

Invar. On a Theory of Invar, Kotaro Honda and Hiromu Takagi. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 54-61, 7 figs. Described as a nickel steel containing 35.4 per cent of nickel and also small quantities of carbon and manganese; its remarkable property is said to be its extreme smallness of the coefficient of thermal expansion. Authors attempt to explain small expansibility of invar without assuming any compound of iron and nickel.

Nickel-Copper. See NICKEL-COPPER STEEL.

Physical Properties. Action of Metallurgical Additions Upon Anomaly of Expansibility of Nickel Steels (Action des additions métallurgiques sur l'anomalie de dilatabilité des aciers au nickel), Ch.-Ed. Guillaume. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 25, June 21, 1920, pp. 1433-1435, 2 figs. Graphs showing variations of coefficient of expansion against deviation in nickel content of invar steel, for four nickel steels, one containing additional small amount of carbon, and others chromium, copper and manganese, respectively; also variation of coefficient of expansion against percentage of third constituent for constant proportion of nickel and iron.

Changes Produced by Heat in Elastic Properties of Nickel Steels (Changement thermique des propriétés élastiques des aciers au nickel), M. P. Chevenard. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 25, June 21, 1920, pp. 1499-1502, 2 figs. Graphs plotted from measurements of modulus of torsion, at various temperatures, of differ-

ently treated specimens of steel with 36 per cent nickel.

Expansibility of Nickel Steels (Valeurs des dilatabilités des aciers au nickel types), Ch.-Ed Guillaume. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1554-1557, 2 figs. Graphs giving coefficient of expansion at 20 deg. cent. of nickel steels of different nickel percentages and containing 0.4 per cent manganese and 0.1 carbon per cent simultaneously.

Thermal Treatment. Critical Ranges of Some Commercial Nickel Steels, Howard Scott. Min. & Metallurgy, No. 158, Section 16, Feb. 1920, 17 pp., 11 figs. Transformation-temperature data secured at Bureau of Standards as basis for standardization and specification of thermal treatments for nickel steels.

NITER

Recovery of. Recovery of Nitre and Pitch from "Smoke Candles," E. R. Thomas. Jl. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 388R-391R. Report of chemistry section of British Assn. for Advancement of Sci.

NITRATE INDUSTRY

Chile. Economic Aspects of the Chilean Nitrate Industry. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920, pp. 1207-1211. Summary of economic features of Chilean nitrate industry, showing world-wide requirements of this Chilean natural product for agricultural and industrial purposes. Work of Nitrate Producers' Association and outlook for future developments.

Nitrate Industry in Chile, Alejandro Bertrand. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 339-343, 6 figs. Review of operation of nitrate plant for recovery of sodium nitrate, iodine and potassium nitrate. Needs of improvements in this industry and some of technical problems to be solved.

NITRATE PLANTS

Electricity in. Electrical Distribution at Nitrate Plant, C. D. Gray and E. Hagenlocher. Elec. World, vol. 76, no. 3, July 17, 1920, pp. 113-116, 10 figs. How electrical energy was used at U. S. nitrate plant in various processes. Difficult problems were encountered by exposure of apparatus to chemical fumes.

Government. Government Plans of Operation of Nitrate Plant No. 2, Arthur Glasgow. Chem. Age, vol. 28, no. 5, May 1920, pp. 155-157. Describes how Government proposes to maintain and continually enhance military value of U. S. Nitrate Plant No. 2 and Muscle Shoals, while substituting its peace-time output for imported nitrogen compounds on terms highly beneficial to American agriculture.

[See also ELECTRIC PLANTS, Nitrate Plant.]

NITRATES

Chile. The Chilean Nitrate Deposits, W. L. Whitehead. Economic Geology, vol. 15, no. 3, April-May 1920, pp. 187-224, 33 figs. Theory that deposits are of volcanic origin is examined in the light of information gathered in survey of regions.

Nitrometer Determination of. The Effect of Chlorides on the Nitrometer Determination of Nitrates, M. T. Sanders. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 169-170, 1 fig. It is reported that it was impossible to obtain results accurate to 0.1 per cent if sample contained more than 15 to 17 per cent sodium chloride on dry basis.

NITRIC ACID

Manufacture. Manufacture of Nitric Acid from Nitrogen Oxide (Sur la formation de l'acide nitrique à partir de l'oxyde azotique), A. Sanfourche. Bulletin de la Société chimique de France, vol. 25-26, no. 12, Dec. 1919, pp. 633-655, 5 figs. Account of experimental study of conditions of oxidation of NO at temperatures from—50 to 500 deg. cent.

Rare Metals and Compounds of Rare Earths as Contact Materials (Edelmetalle und Verbindungen der seltenen Erden als Kontaktstoffe), S. Halen. Edel-Erden u. -Erze, vol. 1, no. 9, Feb. 1920, pp. 102-105. Account of American and European processes for manufacture of nitric acid by oxidation of ammonia by means of catalyzers; the hydrogenization of fats; and the production of chlorine.

War Experiences in the Manufacture of Nitric Acid and the Recovery of Nitrous Fumes, James Walker. Jl. Chem. Soc., vol. 117 and 118, no. 690, April 1920, pp. 382-389. Work done under auspices of Chemistry Department of Edinburgh University.

Specific Heat. See SULPHURIC ACID, Specific Heat.

NITROBENZENE

Absolute Retardation in. Absolute Retardation in Kerr Phenomenon (Les retards absolus dans le phénomene de Kerr), M. Pauthenier. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 101-103. Method for observing absolute retardation in nitrobenzene.

NITROCELLULOSE

Nitrogen in, Estimation of. The Estimation of Nitrogen in Nitrocellulose and Inorganic Nitrates with the Nitrometer, Ernest George Beckett. Jl. Chem. Soc., vol. 117 and 118, no. 689, March 1920, pp. 220-235, 1 fig. Result formulated from research is that nitrometric estimation of nitrogen in nitrocellulose invariably gives results which are too low. It was found that interval of time which is allowed to elapse between introduction of nitrate and sulphuric acid into nitrometer and shaking has great influence on results in case of nitrocelluloses; effect, however, is less in case of inorganic nitrates.

Testing. The Two Most Commonly Employed Methods in Germany for Determination of the Chemical Consistency of Nitrocellulose and a New Method of Heat Testing (75 Deg.) [Ueber die beiden in Deutschland gebrauchlichsten Methoden zur Bestimmung der chemischen Beständigkeit von Nitrozellulose und über eine neue Warmlagermethode (75 deg.)], F. Lenze and B. Pleus. Zeitschrift für das gesamte Schiess- u. Sprengstoffwesen, vol. 14, nos. 18 and 19, 2nd Sept. and 1st Oct. issues, 1919, pp. 297-299 and 315-318, 8 figs. Notes on development of methods for testing chemical consistency of nitrocellulose; brief description of the nitric oxide method, the manometric method and a new method of heat testing. Work completed in 1914, but withheld from publication during war.

NITROCELLULOSE FILMS

Storing and Protecting. Fire Hazard of Nitro-Cellulose Film and Pyroxylin Compounds, George W. Booth. Safety Eng., vol. 38, no. 6, Dec. 1919, pp. 349-353. Results of tests made to determine best methods of storing and protecting nitro-cellulose films.

NITROGEN

Absorption of Oxides by Nitric Acid. On the Absorption of Oxides of Nitrogen by Nitric Acid, Eric K. Rideal. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 531-538, 7 figs. It is concluded from results obtained in experiments that rate of absorption of nitrogen diox-

ide by water and nitric acid solutions follows a monomolecular law. It is believed that production of strong nitric acid may be accomplished by process of refrigeration of a gas mixture containing suitable proportions of nitrogen, dioxide, water vapor and oxygen.

Atmospheric, Fixation of. See Fixation of.

Atmospheric, Utilization of. Utilization of Atmospheric Nitrogen, Thomas H. Norton, Dept. of Commerce & Labor Bur. of Manufactures, Special Agents Series no. 52, 1912, 178 pp., 5 figs. Deals with present supply of nitrogen, synthetic production of ammonia, synthesis of nitric acid, hydrocyanic acid, cyanides, nitrides and calcium cyanamide from atmospheric nitrogen and coal waste and peat as sources of ammonia.

Consumption in U. S. Consumption of Inorganic Nitrogen in the United States, D. P. Gaillard. Chem. & Metallurgical Eng., vol. 22, no. 17, April 28, 1920, pp. 783-786, 1 fig. Attempt is made to forecast future consumption of inorganic nitrogen in the United States from examination of conditions during last twenty years.

Demand in U. S. The Demand and Supply of Fixed Inorganic Nitrogen in the United States, Alfred H. White. Chem. & Met. Eng., vol. 22, no. 7, Feb. 25, 1920, pp. 369-371, 1 fig. Review of our present and future needs of nitrogen and of advantage resulting in continuous operation of Government nitrate plants to help supply industrial and agricultural requirements.

Estimation. See NITROCELLULOSE,. Nitrogen in.

Fixation. Catalysts for the Fixation of Nitrogen, E. K. Rideal and H. S. Taylor. Chem. Age, vol. 1, no. 18, Oct. 18, 1919, pp. 488-490, 1 fig. The Haber process.

Cyanamide Process Plant at Muscle Shoals, Chester H. Jones. Chem. & Metallurgical Eng., vol. 23, no. 5, Aug. 4, 1920, pp. 182-187, 16 figs. Sketch of U. S. Nitrate plant No. 2 shown by photographs and flow sheets.

Direct Firing and By-Product Power Production. Iron Age, vol. 105, no. 18, April 29, 1920, pp. 1234-1235. Report to British Ministry of Munitions comparing costs of two methods of producing electric power for nitrogen-fixation plant.

Distillation of Liquid Air and Separation of Gas from Atmosphere (La distillation de l'air liquide et la séparation des gaz de l'atmosphére), P. Pollard. Vie Technique & Industrielle, vol. 1, no. 3, May 1920, pp. 114-117, 2 figs. Georges Claude process of extracting nitrogen from atmosphere.

Electrical Energy in Fixation of Nitrogen, Eric A. Lof. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 148-149. Notes on comparative value of arc process, cyanamid process, synthetic ammonia process, and cyanide process.

Nitrogen Fixation, L. H. Parker. Gas Jl., vol. 149, no. 2959, Jan. 27, 1920, pp. 186-187. Report of Nitrogen Products Committee appointed by Advisory Panel of Munitions Inventions Dept. to report on conditions of nitrogen industry in England and the British Empire.

Nitrogen Fixation by the Haber Method, Chester H. Jones. Chem. & Met. Eng., vol. 22, no. 23, June 9, 1920, pp. 1071-1075, 6 figs. Writer believes aside from opinions of scientific investigators who have become enthusiastic over possibilities of Haber method, it is still considered by more conservative technical men to be coming process for nitrogen fixation, because of lower cost of manufacture combined with purity of product; but cyanamide process is only practical and commercial method established in United States today for direct fixation of atmospheric nitrogen, and it is possible that it may never be displaced by another method. Notes on preparation of gases for catalysis in Haber process, design of apparatus, existing plants, cost and difficulties in operation and future development.

Nitrogen Products. Iron & Coal Trades Rev., vol. 100, no. 2708, Jan. 23, 1920, p. 110. Report of Nitrogen Products Committee appointed by Advisory Panel of Munitions Inventions Department to consider relative advantages of various methods for fixation of atmospheric nitrogen from point of view both of war and peace purposes.

The Fixed Nitrogen Research Laboratory, Arthur B. Lamb. Chem. & Metallurgical Eng., vol. 22, no. 21, May 26, 1920, pp. 977-979, 11 figs. Brief statement with illustrations of Government investigations being made on cyanamide, Haber and arc processes for producing fixed nitrogen. National aspects of problem.

The War and Key Industries, with Special Reference to the Fixed Nitrogen Industry, James J. Dobbie. Jl. Chem. Soc., vols. 117 & 118, no. 690, April 1920, pp. 430-444. Presidential address delivered at Annual General Meeting of Chem. Soc.

Theoretical Study of Nitrogen Fixation by the Electric Arc, Charles P. Steinmetz. Chem. & Metallurgical Eng., vol. 22, nos. 7, 8, 9 and 10, Feb. 18, 25, Mar. 3 and 10, 1920, pp. 299-304, 353-357, 411-416 and 455-462, 14 figs. Chemical dynamics of nitrogen-oxygen reactions at temperatures of arc and during cooling. Effect of rate cooling on dissociation of NO cooling curves. Equations of reaction velocity and temperature equilibrium. Tables of thermal nitrification constants, reaction periods and velocities in air. Cooling of arc by diabatic expansion and by molecular diffusion. Kinetic aspects of nitrogen-oxygen reactions; effect of arc in dissociating N_2, O_2 and NO; influence of molecular vibration speeds; probability law; concentrations of NO; principles of electric arc.

Nitrogen Products Committee Report. The Report of the Nitrogen Products Committee, H. A. Humphrey. Jl. Soc. Chem. Industry, vol. 39, no. 2, Jan. 31, 1920, pp. 25r-29r. Salient features of report presented to Minister of Munitions (England) by Nitrogen Products Committee of Munitions Invention Department. It is stated that committee, composed of scientists and technical men, spent three years in collecting information on nitrogen situation from all sources, and writer considers that "no more important scientific report has ever been published by Government."

Production of. The Production of Protective Gases for the Protection of Inflammable Liquids Against Fire (Schutzgaserzeugung für die Sicherung feuergefährlicher Flüssigkeiten), H. Wendt. Feuerwehrtechnische Zeitschrift, vol. 7, nos. 23-24, Dec. 5-20, 1919, pp. 186-189, 3 figs. Description and illustrations of plants for production of nitrogen from liquid air, production of nitrogen-carbonic acid mixtures by combustion of the oxygen contained in the air, etc.

Radiating Potentials of. The Radiating Potentials of Nitrogen, H. D. Smyth. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 409-426, 8 figs. Formula is derived by which, it is said, accurate corrections allowing for distribution of velocities of impacting electrons may be applied to observed values of radiating potentials. It is also reported that qualitative evidence was obtained supporting Davis and Goucher's discovery of true ionization of nitrogen introduced in neighborhood of 18 volts.

Solution by Water. The Determination of the Rate of Solution of Atmospheric Nitrogen and Oxygen by Water, W. E. Adeney and H. G. Becker. Lond., Edinburgh & Dublin Phil. Mag.

& Jl. of Science, vol. 39, no. 232, April 1920, pp. 385-404, 9 figs. Method is outlined which consists in enclosing large bubble of air of known volume in narrow tube containing deaerated water, and allowing bubble to pass up through water repeatedly until saturation is reached. Pressure in bubble is measured after each double passage up tube by means of water manometer. Pressure is explained for reducing observations to unit area and volume.

Supply in U. S. Supply of Inorganic Nitrogen in the United States, D. P. Gaillard. Chem. & Metallurgical Eng., vol. 22, no. 18, May 5, 1920, pp. 841-845, 1 fig. Summary of figures on consumption and supply showing deficiency even if government plants are operated.

Viscosity. See VISCOSITY, Gases.

World's Resources. Political and Commercial Control of the Nitrogen Resources of the World, Chester G. Gilbert. Chem. & Metallurgical Eng., vol. 22, nos. 10, 11 and 12, Mar. 10, 17 and 24, 1920, pp. 443-448, 501-504 and 557-559. Mar. 10: General review of sources of nitrogen—atmospheric, nitrate ore, organic and in carboniferous deposits—with description of general aspects of control of nitrogen resources in normal and war times. Mar. 17: Description of commercial aspects of nitrogen resources: natural, by-product and fixation compounds, and of recent developments and changes in nitrogen industry practice. Mar. 24: Review of economic nitrogen industry outlook. Chilean nitrate, nitrogen fixation, by-product and organic nitrogen and by-product ammonia. Bibliography of recent literature on the nitrogen industry.

NITROGEN INDUSTRY

Development of. The Nitrogen Industry, Herman Edward Fischer. Jl. Franklin Inst., vol. 190, no. 2, Aug. 1920, pp. 187-210. Recent developments and present tendencies. Bibliography.

NITROMETER

See NITROCELLULOSE, Nitrogen in.

NITROUS GASES

Analysis. A Method for the Analysis of Nitrous Gases and Its Application to the Study of Towers for the Absorption of Such Gases, A. Geake and F. J. Squire. Jl. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 367T-369T, 3 figs. Devised for analysis of gases in system of absorption towers used in connection with plant for denitration of nitroglycerin spent acid.

NON-FERROUS METALS

Electrical Melting. Electrical Melting of Alloys, H. W. Gillett. Foundry, vol. 48, no. 5, March 1, 1920, pp. 177-180. Fundamental reasons underlying evolution of electric furnaces for melting non-ferrous metals are analyzed. Each type of furnace is taken up separately and its merits and limitations are pointed out.

Flux Skimming. Flux-Skimmings, H. Proctor Smith. Metal Industry, vol. 15, no. 19, Nov. 7, 1919, pp. 386-387, 1 fig. Its formation, use, and method of treatment.

Melting. See Electrical Melting; ELECTRIC FURNACES, Non-Ferrous Metal Melting; FURNACES, METALLURGICAL, Non-Ferrous-Metal Melting.

Naval Machinery, Uses in. Non-Ferrous Metals and Alloys and the Naval Engineer. Shipbuilding & Shipping Rec., vol. 15, no. 12, March 18, 1920, pp. 370-371. Uses of various non-ferrous metals and alloys in naval machinery are pointed out, such as, for example, manganese bronze used for propellers by British Admiralty, aluminum-bronze for turbine blades, etc.

The Use of Non-Ferrous Metal in Naval Machinery, George Goodwin. Eng., vol. 109, no. 2828, Mar. 12, 1920, pp. 354-355. Surveying development of naval machinery, attention is directed to use of non-ferrous metals in condenser tubes, propeller blades and bearing metals. Paper read before Inst. of Metals.

Researches. A Study of Researches into Metallic Alloys, C. T. Heycock. Chem. Age (Lond.), vol. 3, no. 63, Aug. 28, 1920, pp. 229-232. Also in Nature (Lond.), vol. 106, no. 2654, Sept. 9, 1920, pp. 60-62. Presidential address in Chemical Section, British Association for Advancement of Science.

Specifications. Report of Committee B-2 on Non-Ferrous Metals and Alloys. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 33 pp. Revised specifications for copper bars for locomotive staybolts, and for aluminum ingots for remelting and rolling; also revised methods for chemical analysis of alloys of lead, tin, antimony and copper.

[See also ALLOYS; ALUMINUM COPPER; ZINC, NICKEL, Etc.]

NOTATION

Octaval. See OCTAVAL NOTATION.

NOZZLES

Characteristics. Characteristics of Nozzles (Die Düsencharakteristik), Gustav Flügel. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 217, 1919, 33 pp., 16 figs. Writer states that there are in connection with discharge of gases and steam from nozzles, still a number of technically important phenomena which require analysis. He gives results of investigations, completed in 1915, to show action of nozzle back pressure with normal discharge of gases, and contends that other works published since that time confirm his conclusions.

De Laval. The Determination of Temperature of Rapidly Flowing Gases or Vapors by Expansion in a de Laval Nozzle (Ueber die Ermittlung des Temperaturverlaufes von schnellströmenden Gasen oder Dämpfen bei Expansion in einer Laval-Düse), Friedrich Mäller. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 6, 7, 8 and 9, Feb. 29, Mar. 10, 20 and 30, 1920, pp. 61-65, 76-80, 87-90 and 100-106, 26 figs. Results of experiments show agreement with Batho that temperatures of wet vapors flowing in a nozzle are properly measured with thermocouples, and accord with Nusselt that in temperature measurement of dry and superheated steam, the use of thermocouples must be avoided, and contrast of the contradictory results is explained. It is said that a final solution can probably be achieved only with aid of a more precise testing device.

Field-Sprinkling. Experiments with Different Types of Nozzles for Field-Sprinkling (Versuche mit verschiedenen Düsenformen für Feldberegnung), E. Krüger. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 15-16, Apr. 17, 1920, pp. 322-326, 17 figs. Results of experiments are said to show that, although none of the tested nozzles answer all requirements, a number of them are practicable. It is pointed out that every nozzle now in use covers a circular area in middle of which the nozzle is located, including ground directly in front of it, thereby impeding the forward movement of sprinkler, and it is suggested that efforts should be made to construct a nozzle of sufficient spraying force, but with discharge directed backwards only.

Sewage Sprinkler. Sewage Sprinkler Nozzles.

Public Works, vol. 48, no. 16, May 1, 1920, pp. 380-382, 4 figs. Coefficients of discharge of eight different kinds of nozzles were determined by experiments conducted at hydraulic laboratory of Purdue University. In general, coefficient for any one nozzle was found constant for heads exceeding 1.5 ft.

Steam Action in. Steam Action in Simple Nozzle Forms. A. L. Mellanby and Wm. Kerr. Eng., vol. 110, no. 2853, Sept. 3, 1920, pp. 310-314, 15 figs. Charts giving pressure ratio curves for various types, constructed from results obtained from experiments. Paper read before Eng. Section, British Assn. for Advancement of Science.

NUTS

Manufacture. Making 30,000 Nuts in 9 hours on One Machine, J. H. Moore. Can. Machy., vol. 24, no. 11, Sept. 9, 1920, pp. 243-245, 5 figs. Nut and Bolt Dept. of plant of International Harvester Co., Ltd. Hamilton, Canada.

The Design of Upsetting Machine Dies. Mech. World, vol. 67, no. 1724, Jan. 16, 1920, pp. 34-35, 5 figs. Illustrates making of nuts in upsetting machine.

Standards for. See BOLTS, Standards for.

NYSTAGMUS

See HEALTH, Miners' Nystagmus.

O

OCCLUDED GASES

See also HYDROGEN, Occlusion of; PUMPS, Mercury.

OCTAVAL NOTATION

Shop Use of. Octaval Notation in Shop Measurements, Alfred Watkins. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 870-871 and 905, 4 figs. Advocates adoption of octaval notation to denote British binary inch fractions in workshop and on workshop measuring instruments. Octaval rule, simple vernier calipers, double vernier calipers, single-screw micrometer, and two-screw micrometer using octaval notation are described and discussed.

OFFICE BUILDINGS

See BUILDINGS. Office.

OFFICE MANAGEMENT

Addressing Systems. A Survey of Mechanical Addressing Systems, John R. Conover. Am. Gas Light Assn. Monthly, vol. 2, no. 9, Sept. 1920, pp. 552-556. List giving principal points of operation of various systems.

Gas Works. Office Organization, W. C. Jackson. Gas Jl., vol. 148, no. 2943, Oct. 7, 1919, pp. 27-29, 1 fig. Suggested scheme for gas works. Paper read before Wales and Monmouthshire Dist. Instn. of Gas Engrs. & Managers.

Office Equipment. Getting the Office Work Done, Wallace Clark. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 189-194, 4 figs. Suggestions in regard to furnishing and equipping an office.

Office Managers. Getting the Office Work Done, Wallace Clark. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 267-270, 1 fig. Suggestions to office managers.

Order Records. Keeping Track of Orders at the Plants of the Ohio Ballast Co. Rock Products, vol. 22, no. 24, Nov. 22, 1919, pp. 24-25, 3 figs. Forms of records used.

Principles. Getting the Office Work Done, Wallace Clark. Indus. Management, vol. 60, no. 1, July 1920, pp. 13-16, 3 figs. Application of principles of industrial management to organization and management of offices.

Stenographic Department. Getting the Office Work Done, Wallace Clark. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 116-121, 6 figs. How to organize stenographic department.

OIL

Analysis. The Analysis of Paraffins and Oils (Zur Analyse von Paraffinen und Oelen), K. Bube. Petroleum, vol. 16, no. 1, May 1, 1920, pp. 5-8. Shows how analysis for determination of oil and paraffin content and composition of the paraffin can be made through the simple determination of specific weight and melting point. Gives numerical values derived from the sweating process.

Engines. See OIL ENGINES.

Fields. See OIL FIELDS.

Flow in Pipes. See FLOW OF OIL, Pipes.

Fuel. See OIL, FUEL.

Fuel, Storage of. See OIL, FUEL, Storage.

Petroleum. See PETROLEUM.

Pipe-Line Transmission. Oil-Pipe Line Transmission, H. W. Crozier. Jl. Electricity, vol. 44, no. 1, Jan. 1, 1920, pp. 24-27, 3 figs. Study of methods of determining viscosity, particularly in general case of pipe lines where oil, initially heated, cools rapidly as it flows along.

Pipe Lines. See PIPE LINES.

Pumping. See OIL WELLS, Pumping.

Shales. See OIL SHALES.

Wells. See OIL WELLS.

[See also PETROLEUM.]

OIL ENGINES

Air Injection for. Air Injection for High-Pressure Oil Engines, J. L. Chaloner. Motorship, vol. 5, nos. 8 and 9, Aug. and Sept. 1920, pp. 710-711 and 806-810, 23 figs. Discussion of compressed air as an atomizer. Records of ratio of fuel to injection-air obtained in tests on a number of four-stroke engines of varying power.

Akroyd Type. Modern Developments of Oil Engines, Mark Meredith. Gas Engine, vol. 22, no. 1, Jan. 1920, pp. 32-33. Particularly of type using Akroyd principle.

Anderson. The Anderson Oil Engine. Gas Engine, vol. 22, no. 6, June 1920, pp. 163-167, 7 figs. Description and illustrations of a combined wet-and-dry type engine, made in two bores and strokes and various combinations of cylinders.

Bergsund. Marine Oil-Engine with Outstanding Features. Motorship, vol. 5, no. 4, April 1920, pp. 324-326, 12 figs. Swedish Bergsund surface-ignition type which is being installed in craft up to 1000 tons deadweight capacity.

Central-Station. See CENTRAL STATIONS, Oil-Burning Engines for.

Combustion Phenomena. The Combustion Phenomenon in the Oil Engine (Der Verbrennungsvorgang in der Oelmaschine), Otto Alt. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 33, Aug. 14, 1920, pp. 637-643, 13 figs. Discussion of modern spraying process of Vickers and Steinbecker without compressed air, evaporation or pyrogenous decomposition of the different fuels; influence of compression on automatic ignition. Investigation demonstrates that the expensive experimental work of oil-

engine firms cannot yet be dispensed with, and chemical and technical coöperation is absolutely essential in the interest of progress.

Crossley Cold-Starting. The Crossley Cold Starting Oil Engine. Power House, vol. 13, no. 6, Mar. 20, 1920, pp. 128-131. Engine of four-cycle type is manufactured in sizes of 10 b.hp. to 130 b.hp. per cylinder. Article refers especially to 117-b.hp. engine with cylinder bore of 18.5 in. and stroke of 28 in., which develops its normal load at 180 r.p.m.

Doxford Opposed Piston. The Doxford Opposed Piston Two-Stroke Oil Engine. Practical Engr., vol. 62, no. 1751, Sept. 16, 1920, pp. 180-181, 2 figs. Advantages claimed for opposed piston engine are (1) absence of cylinder heads, (2) the perfect form of combustion chamber, and (3) that scavenging is complete and powerful by reason of the scavenging air entering cylinder at one end around the whole of circumference, and leaving at other end again around whole of circumference.

Entropy Diagram. The Entropy Diagram as a Basis for the Investigation of an Oil Engine (Das Wärmediagramm als Grundlage für die Untersuchung einer Oelmaschine), H. Zwerger. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 52, Dec. 27, 1919, pp. 1311-1317, 3 figs. Discusses use of Stodola's temperature entropy diagram in analysis of gas-engine operation and gives results of investigations carried out on a 12-hp. Deutz oil engine.

Fairbanks-Morse. The Fairbanks-Morse "C-O" Marine Oil Engines. Practical Engr., vol. 62, no. 1752, Sept. 23, 1920, pp. 201-203, 5 figs. Outstanding features are (1) no water injection into cylinders, (2) water jacketing of combustion chamber and exhaust manifold, and (3) special means for quick starting.

Fuel Spraying. A Study of the Phenomena Observed in the Combustion Space of Oil Engines in Connection with Fuel Spraying (Erwägungen über die Vorgänge im Verbrennungsraum beim Einspritzvorgang), F. Ernst Bielefeld. Motorwagen, vol. 22, nos. 32 and 33, Nov. 20 and 30, 1919, pp. 614-620 and 631-635, 35 figs. Various existing theories explaining these phenomena are pronounced incorrect, and it is claimed phenomena can be explained by the assumption that the molecules represent very small bubbles. Requirements for effecting a perfect combustion are discussed.

High-Compression. The High Compression Oil Engine, J. L. Chaloner. Gas & Oil Power, vol. 15, no. 180, Sept. 2, 1920, pp. 193-198, 11 figs. Steinbecker four-stroke type.

Hvid. The Hvid Engine and the Fuel Problem, E. B. Blakely. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 918-920, 6 figs. Advantages claimed for Hvid type of engine, which is being produced in units as small as 1½ hp., are that it can be started cold, has no complicated air compressor systems, and is so economical that it can compete with gasoline engines of same size. After outlining operation of engine writer discusses its heat balance and torque characteristics.

Ingersoll-Rand. Many New Ideas in Ingersoll-Rand P-R Oil Engine. Automotive Manufacturer, vol. 62, no. 3, June 1920, pp. 7-12, 6 figs. New type of engine said to possess many novel features and to produce high unit power output and low fuel consumption, as well as remarkably slow speed.

Marine. A High-Compression Marine Oil Engine. Engr., vol. 130, no. 3375, Sept. 3, 1920, pp. 224-226, 5 figs. Built by Plenty & Son, Ltd., Newbury, England. Engines are manufactured with two sizes of cylinders, 270 mm. bore by 300 mm. stroke and 335 mm. by 350 mm. grouped according to power required.

The British Kromhout Marine Oil Engines. Petroleum Times, vol. 4, no. 88, Sept. 11, 1920, p. 263, 1 fig. Describes new type of marine oil engine known as 4 M 6 type, developing about 320 brake horse power or 385 I.H.P.; operated on two-stroke cycle system, has four cylinders, and full power is developed at about 225 r.p.m.

The Neptune Type B Marine Oil Engine. Practical Engr., vol. 62, no. 1750, Sept. 9, 1920, pp. 164-166, 3 figs. Features are small height, light weight construction which permits of piston being taken out for examination either from top or bottom of cylinder.

Marine, Tanks for. Tanks for Marine Oil-Engine Installations, S. Howard Sweet. Motorship, vol. 5, no. 2, Feb. 1920, pp. 133-134, 5 figs. Suggests arrangements for small motor vessels.

Mine Power Plants. An Oil Engine Installation in New Mexico, Theodore M. Robie. Eng. & Min. Jl., vol. 109, no. 13, March 27, 1920, pp. 755-757, 3 figs. Power plant of Empire Zinc Co. with two 250-hp. twin horizontal, four-stroke-cycle type oil engines.

Neptune. The "Neptune" Marine Oil Engine, Type B. Shipbuilder, vol. 21, no. 111, Nov. 1919, pp. 283-286, 3 figs.; also vol. 22, no. 115, March 1920, pp. 219-222, 3 figs. Engine is of reversible, inverted, single-acting, marine type, two-cycle, self-contained and consists of six working cylinders, two scavenging cylinders, one air compressor, two circulating pumps and the necessary bilge pumps.

Solid-Injection. The Lincoln Works of Messrs. Ruston and Hornsby, Limited. Eng., vol. 110, no. 2844, July 2, 1920, pp. 4-10, 24 figs. partly on 2 supp. plates. Among principal products manufactured are solid-injection crude-oil engines which are built of single-cylinder type in 11 sizes ranging from 15 b.hp. to 170 b.hp. and double-cylinder type in 5 sizes from 100 b.hp. to 340 b.hp. Engine of latter type developing 260 b.hp. is described and illustrated.

The Steinbecker Solid-Injection Engine. Motorship, vol. 5, nos. 7 and 8, July and Aug. 1920, pp. 625-626 and 712-713, 4 figs. New design of constant-pressure oil motor, built by German Automobile Construction Co., Ltd., Berlin, and the Hanover Machine Co.

Steinbecker. See Solid-Injection.

Still vs. Sulzer. Comparative Trials of "Still" and "Sulzer" Engines Under Actual Working Conditions on Board Ship, William Denny. Shipbuilding and Shipping Rec., vol. 16, no. 3, July 15, 1920, pp. 92-94, 8 figs. Two types of oil engines tried out in same vessel, principal aim being to ascertain accurately oil used in terms of speed of vessel. Paper read before Instn. of Naval Architects.

Testing. Heat Balance as Basis for Testing an Oil Engine (Das Wärmediagram als Grundlage für die Untersuchung einer Oelmaschine), Ludwig Zwerger. Verein deutscher Ingenieure Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 216, 1919, 48 pp., 36 figs. Tests are said to have shown that it is possible to dispel any doubts regarding the operation of an internal-combustion engine by means of heat diagram, as observed during comparison of Deutzer oil motor, normal Diesel motor and an explosion motor. It is concluded that for economic working of high-compression motors it is necessary to supply them with maximum amount of air.

Oil Engine Testing Methods, G. N. Somerville. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 115-116, 2 figs. Forms of brakes generally used by manufacturers.

[See also DIESEL ENGINES; HEAVY-OIL ENGINES; KEROSENE ENGINES; SEMI-DIESEL ENGINES; MARINE ENGINES, Heavy-Oil.]

OIL FIELDS

Alsace. The Oil Fields of Alsace (Les gisements de pétrole d'Alsace), Paul de Chambrier. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 132, no. 1, Jan.-Feb. 1920, pp. 45-70, 9 figs. Mining and refining operations.

Argentine. Petroleum in Commodoro Rivadavia (El petró leo en Commodoro Rivadavia), Walter C. Kretz. Ingenieria Internacional, vol. 4, no. 4, Oct. 1920, pp. 195-201, 7 figs. Description of oil fields and methods of exploitation.

Boryslaw, Galicia. Geological Notes on the Boryslaw Petroleum Field in Galicia (Remarques géologiques sur le profil du champ pétrolifère de Boryslaw en Galicie), Arnold Heim. Archives des Sciences physiques et naturelles, vol. 1, no. 5, July and Aug. 1919, pp. 289-301, 2 figs., on two supp. plates. Stratigraphic study specially of zone which is believed to indicate permanently passage from Eocene and Olgocene in tertiary series.

British Empire. The Oil Resources of the British Empire, John Cadman. Jl. Royal Soc. of Arts. vol. 68, no. 3532, July 30, 1920, pp. 584-596 and (discussion) pp. 596-600. Statistics of production with comparative analyses of various kinds of oil.

Canada. The Oil Possibilities of Western Canada, D. B. Dowling. Can. Min. Inst. Bul., no. 98, June, 1920, pp. 469-477, 2 figs. Includes diagrams showing basins occupied by Palæozoic and Cretaceous sediments.

Decline Curves. Variation in Decline Curves of Various Oil Pools, Roswell H. Johnson. Min. & Metallurgy, no. 157, section 8, Jan. 1920, 5 pp. Based on data given in Manual of the Oil and Gas Industry published by Treasury Department, Washington.

Egypt. The Oilfields of Egypt: A Study of the Geology, W. F. Hume. Petroleum Times, vol. 2, nos. 37 and 38, Sept. 20 and 27, 1919, pp. 269-270 and 295-296, 1 fig. Strata connected with oil occurrences in Gulf of Suez area.

Fallon, Nev. Prospecting for Oil at Fallon, Nev. Eng. and Min. Jl., vol. 110, no. 4, July 24, 1920, pp. 169-172, 4 figs. Tertiary Lake beds in vicinity of Stillwater Range scene of wildcat drilling. Over 56 companies have formed or are in process of formation, but there are few indications of oil discovered.

Geology. Geologic and Economic Features of Oil Structures, Victor Ziegler. Economic Geology, vol. 15, no. 3, April-May, 1920, pp. 247-258. It is claimed that (1) comparatively recent age of formation, (2) slight folding, very closely following period of deposition, and (3) rock originally rich in organic remains, are features favoring maximum accumulation of oil.

Germany. The Occurrence of Petroleum, Petroleum Gases and Shale in the Baltic Sea Provinces (Die Vorkommen von Erdöl, Erdölgasen und Brandschiefern in den baltischen Ostseeprovinzen Estland, Livland und Kurland), Fritz M. Behr. Petroleum, vol. 14, nos. 15 and 16, May 1 and May 15, 1919, pp. 703-711 and 773-779. Notes on the geological structure of the Baltic provinces; the dictyograptus shale deposits in Esthonia which are said to have as high as 22.41 per cent bitumen content; and petroleum fields in Courland. Table is included showing composition of the shale strata. Exploitation up-to-date of petroleum in Baltic provinces and technical value of the bituminous shale. Bibliography and review of more recently published work by F. Beyschlag and L. von zur Mühlen entitled "Earth Treasures of Esthonia."

The Petroleum Fields of Roumania Compared with Those of Northwest Germany (Die Erdöllagerstätten in Runänien verglichen mit denen in Nordwestdeutschland), G. Gürich. Petroleum, vol. 14, no. 13, Apr. 1, 1919, pp. 597-601, 5 figs. Writer points out dissimilar features of the German and Roumanian oil fields, but claims, nevertheless, that a great similarity exists. Notes on the stratigraphy of the Roumanian oil territory and a geological sketch of Roumanian petroleum zone presented by Mrazec in 1907, along with report of investigations at the 3rd Petroleum Congress at Bucharest.

Goose Creek, Emulsions in. Oil-Field Emulsions, J. L. Sherrick. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 133-139, 2 figs. It is concluded from investigation that emulsions occurring in Goose Creek oil fields consist of salt solution as disperse phase and oil containing asphalt as dispersing phase.

Indiana. See Ohio.

Kentucky. Oil Fields of Kentucky and Tennessee, L. C. Glenn. Min. & Metallurgy, no. 157, section 5, Jan. 1920, 12 pp. Geology and technology of oil fields.

Mackenzie River Basin. The Mackenzie River Basin, Phillip Thompson. Eng. & Min. Jl., vol. 108, no. 21, Dec. 6, 1919, pp. 866-868, 1 fig. Geological features of the area and most favorable regions in which to prospect for minerals and oil.

New Mexico. Probable Oil Resources of New Mexico, John K. Knox. Eng. & Min. Jl., vol. 110, no. 2, July 10, 1920, pp. 69-74. Summary of stratigraphic and structural geology of state, with particular reference to possible sources of petroleum; some oil has been discovered, and a few localities are promising. Paper read in more extended form before Am. Assn. Petroleum Geologists.

New York. See Pennsylvania.

Ohio. Rise and Decline in Production of Petroleum in Ohio and Indiana, J. A. Bownocker. Min. & Metallurgy, No. 158, Section 22, Feb. 1920, 12 pp., 2 figs. Geology of region and records of wells.

Pennsylvania. A Résumé of the Pennsylvania-New York Oil Field, Roswell H. Johnson and Stirling Huntley. Min. & Metallurgy, No. 158, Section 23, Feb. 1920, 4 pp. Geological and stratigraphical notes.

Persia and Near East. Petroleum in Persia and the Near East, Edmund M. Spieker. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14, 1920, pp. 316-323, 1 fig. Area is said to comprise richest and most extensive oil-bearing region of the world. Geological characteristics, commercial possibilities and potentialities of future development are indicated.

Power Supply. See CENTRAL STATIONS, Oil Fields.

Relationship with Gas Fields. Experimental Studies of Subsurface Relationships in Oil and Gas Fields, R. Van A. Mills. Economic Geology, vol. 15, no. 5, July-Aug. 1920, pp. 398-421, 10 figs. Apparatus and methods developed by writer for laboratory study of subsurface relationships of oil and gas fields.

Roumania. See Germany.

Russia. The Oil Fields of Russia, A. Beeby Thompson. Min. & Metallurgy, no. 161, May 1920, pp. 27-29. Notes on Baku oil fields. Operated area of 250 acres is said to have produced over 500,000 bbl. per acre.

Taxation. Application of Taxation Regulations to Oil and Gas Properties, Thomas Cox. Min. & Metallurgy, no. 165, Sept. 1920, p. 22. Review of Treasury Department regulations pertaining to practical application of depreciation and depletion and other allowances governing taxation of oil and gas properties.

Tennessee. See Kentucky.

Trinidad. The Trinidad Oilfields. Petroleum

Times, vol. 3, no. 55, Jan. 24, 1920, pp. 87-90. Details concerning island's petroleum industry.

Valuation. The Classification of Undeveloped Oil Lands for Purposes of Valuation, Carl H. Beal. Jl. Inst. Petroleum Technologists, vol. 6, no. 23, July 1920, pp. 297-306; also Economic Geology, vol. 15, no. 4, June 1920, pp. 315-327, 1 fig. Replies received from prominent geologists and petroleum engineers to inquiry as to their views on tentative definitions.

Venezuela and Colombia. Oilfields of Venezuela and Colombia. Petroleum World, vol. 17, no. 237, June 1920, pp. 242-246, 1 fig. Survey of oil area compiled by Geo. A. Huhn & Sons, New York and Philadelphia, including map showing various boreholes for oil put down in Venezuela and Colombia.

Wyoming. The Upton-Thornton Oil Field, Wyoming, E. T. Hancock. Dept. of Interior, U. S. Geological Survey, Bul. 716-B, 1920, 34 pp., 3 figs. Stratigraphic position of oil-bearing sands.

OIL FUEL

Advantages Over Coal. Oil as a Fuel for Boilers and Furnaces, H. H. Fleming. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 345-354, 3 figs. Advantages of fuel oil over coal.

Altering Coal Plant for. Liquid Fuel Burning Installation, Kirk McFarlin. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 136-137, 3 figs. Alterations performed in industrial coal-fired plant in New York to adapt it for oil burning.

Atomizing Burners. Efficiency of Use of Oil as Fuel, W. N. Best. Min. & Metallurgy, no. 163, July 1920, p. 35. Summary of points which should be considered when purchasing atomizing burners. (Abstract.)

Boiler Firing. See BOILER FIRING, Coal vs. Oil; Oil-Fuel Installation.

Burdon Oil-Gas Firing System. The Burdon Oil-Gas System. Iron & Coal Trades Rev., vol. 100, no. 2708, Jan. 23, 1920, p. 115, 2 figs. In Burdon system of oil firing oil is broken up finely by high-pressure air, or air and steam in combination, working through atomizer attached direct to furnace.

Burners for. The Utilization of Oil Fuel in Industrial Furnaces (L'emploi des combustibles liquides dans les foyers industriels), F. Scoumanne. Revue générale de l'Électricité, vol. 7, no. 16, Apr. 17, 1920, pp. 527-536, 3 figs. Comparative study of various types of burners.

The Wallsend-Howden System of Burning Liquid Fuel. Shipbuilding & Shipping Rec., vol. 15, no. 16, April 15, 1920, pp. 519-520, 5 figs. Liquid fuel is injected into furnaces under pressure through burner, where it is atomized. Burner is designed to force oil into furnace in shape of conical spray of fine particles, which burst into flame at distance of from 6 in. to 8 in. from nozzle.

See also FURNACES, BOILER, Oil-Fired.

Burning. Oil Burning, F. G. Hummel. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 900-903. Equipment required and combustion results. Paper read before Louisiana Ice Manufacturing Assn.

Recent Developments in the Design of Oil-Burning Furnaces (Les plus récents procédés de chauffage au mazout), G. Lechartier. Technique Moderne, vol. 12, no. 3, Mar. 1920, pp. 116-123, 25 figs. Attention is directed to adaptation to oil-burning of boilers built to burn coal. One installation in Berlin and another in Rotterdam are described. Results of service tests of various classes of oil fuels conducted at works of Smith Dock Co., North Shields, England, are quoted.

The Efficient Burning of Oil Fuel, Allen F. Brewer. Indus. Management, vol. 60, no. 1, July 1920, pp. 17-22. Summary of good practice.

The Science of Burning Liquid Fuel, W. N. Best. Am. Drop. Forger, vol. 6, no. 8, Aug. 1920, pp. 368-373, 7 figs. Data obtained from tests covering 33 years' experience in burning of different fuels in various types of furnaces.

Burning Appliances. Fuel Oil Burning Appliances, Robert Sibley and C. H. Delany. Jl. of Electricity, vol. 44, no. 12, June 15, 1920, pp. 621-625, 16 figs. Storage tanks, apparatus for measuring oil and oil pumps.

Coal vs. Relative Value of Coal and Oil Fuel, George A. Evans. Power, vol. 51, no. 16, Apr. 20, 1920, pp. 637-638, 1 fig. Points out important facts to be considered on advisability of converting coal-burning power plant to fuel oil.

Colloidal. See PULVERIZED COAL, Tests.

Combustion. Importance and Utilization of Liquid Fuels (L'intérêt et l'utilisation des combustibles liquides), M. Dumanois. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 132, no. 4, July-Aug. 1920, pp. 436-457. Conditions to secure good combustion. Comparative values of oils found in different parts of the earth.

Oil-Burning Installations, C. C. Pounder. Mech. World, vol. 67, no. 1744, June 4, 1920, pp. 360-361. It is pointed out that changes affecting each element participating in processes of burning are most easily and comprehensively expressed by means of equations, a chemical equation showing (1) elements and compounds before and after combination; (2) number of atoms and molecules participating in change; (3) weight of each element and compound present before and after change; and (4) in cases where gases unite to form other gases, volumes of each element and compound before and after. These principles are applied to combustion of oil fuel in furnace of a boiler.

Costs, Heating Valves, Burners, Etc. Oil Fuel, F. W. Staley. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 73-83. Data of comparative costs of various fuels, solid and liquid, heat value of different fuel oils, and also classification and outline of types of oil burners.

Economy. Economies Obtained in Burning Oil, Robert Sibley and C. H. Delany. Elec. World, vol. 75, no. 26, June 26, 1920, pp. 1483-1484. Results obtained at three Arizona plants.

Efficient Burning. How to Burn Fuel Oil Efficiently, Jiles W. Haney. Oil News, vol. 8, no. 6, Feb. 20, 1920, pp. 15-18. Emphasizes that burner must atomize oil so that it will burn like a gas when introduced to a furnace, and observes that higher efficiency is obtained with minimum amount of air necessary for a complete burning.

Fuel Oil vs. Stoker-Fired Coal. Fuel Oil Versus Coal on Mechanical Stokers, F. H. Daniels. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 203-204, 1 fig. Chart to determine what price of oil of different grades must be to compete with coal of various grades at varying prices.

Handling. Handling Heavy Oils at Locomotive Fuel Stations, J. L. Starkie. Ry. Age, vol. 68, no. 15, Apr. 9, 1920, pp. 1147-1148, 4 figs. Points out that tanks and pipe lines must be heated to obtain necessary fluidity in service installations. Describes how turns, bends and expansion joints are handled when steam pipes are placed inside oil pipes.

Industrial Demand. Industrial Demand for Oil as a Fuel, George Otis Smith. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 365-367. It is stated that first three months of 1920 have established rate of domestic production that if unchecked will reach a total of 415,000,000 barrels. Paper read before Am. Iron & Steel Inst.

Kermode's Pressure-Jet System. Self-Contained Pressure-Jet Oil Fuel Plant. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 180-181, 5 figs. Kermode's pressure-jet oil fuel system. Oil is atomized in special burner which uses neither steam nor pressure air, but to which oil is supplied under pressure. Various ships have been fitted with this type of plant.

Marine Boilers. Fuel Oil for Marine Purposes, W. F. Paradies. Jl. Am. Soc. of Marine Draftsmen, vol. 7, no. 1, April 1920, pp. 83-87. Notes on mechanical atomizing of fuel oil for burning on shipboard, and pipe lines of modern fuel-oil installation.

Mechanical Atomizers. Burning Oil with Mechanical Atomizers, Robert Sibley and C. H. Delany. Elec. World, vol. 75, no. 13, March 27, 1920, pp. 727-728, 4 figs. Advantages claimed for mechanical atomizing burner are that mixture of air and gases occurred throughout entire furnace and that large quantities of oil can be burned in furnace of given volume. Disadvantages mentioned are tendency for small orifice in burner to choke up, and separate adjustment of air supply for each burner required every time there is change in quantity of oil burned.

Passenger Ships. Oil Fuel on Passenger Ships. Shipbuilding and Shipping Rec., vol. 16, no. 13, Sept. 23, 1920, pp. 373-376. Report of Board of Trade Committee on prevention of fire on passenger ships burning oil fuel. Minimum flash point. Precautions proposed.

Properties. Oil-Burning Installations, C. C. Pounder. Mech. World, vol. 67, no. 1729, Feb. 20, 1920, pp. 122-123. Varieties and physical properties of fuel oils are defined. Writer describes Baumé's hydrometer as instrument which has come into universal use on oilfields, and although little known to British engineers, he claims it has always had wide commercial application on Continent.

Pulverizing. See Ships.

Reservoirs for. See RESERVOIRS, Oil, Cement Lining for; RESERVOIRS, CONCRETE.

Safety in Firing. The Installation and Cost of Oil Firing (Einbau und Kosten von Oel-Feuerungen), H. Viesohn. Jl. für Gasbeleuchtung, vol. 62, no. 50, Dec. 13, 1919, pp. 746-752, 10 figs. Notes on safety measures to be observed and experiences in the Hattersheim waterworks, Frankfort. Regulations are formulated for preventing accidents with tar-oil firing and it is concluded that its use should be of great value in bridging over the coal shortage in German public and industrial works. Address read before Central Rhenish Assn. of Gas and Water Engineers.

Ships. Utilization of Liquid Fuels in Marine Boilers. Bulletin technique du Bureau Veritas, vol. 2, no. 1, Jan. 1920, pp. 1-4, 5 figs. Constructional details and record of operation of various installations aboard ships. Installations discussed, employ system of pulverizing oil by steam jet.

Storage. Fuel Oil Storage and Sand Drying Plant. Ry. Rev., vol. 65, no. 23, Dec. 6, 1919, pp. 836-837, 4 figs. Combination of sand-drying and fuel oil storage plant recently completed by State Board of Harbor Commissioners at San Francisco.

Fuel-Oil Storage Rules, National Board Fire Underwriters. Power, vol. 50, no. 18, Oct. 27-Nov. 4, 1919, pp. 680-681. Individual oil-burning equipments are prescribed for other than household purposes.

Installing Facilities for Handling Locomotive Fuel Oil, R. M. Stubbs. Ry. Age, vol. 69, no. 9, Aug. 27, 1920, pp. 346-348, 8 figs. Storage and service stations on Missouri, Kansas & Texas Ry.

Methods of Handling and Storing Fuel Oil and Gasoline, Charles L. Hubbard. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 20-23, 6 figs. Points out more important elements of danger in connection with liquid fuels and illustrates method and equipment both for handling and storing.

Rules Governing Storage and Use of Fuel Oils and Construction and Installation of Oil Burning Equipment. Am. Architect, vol. 116, no. 2293, Dec. 3, 1919, pp. 707-708. Adopted by Board of Standards and Appraisals, Nov. 6, 1919, and effective in New York City, Dec. 1, 1919.

Textile-Mill Installations. Fuel Oil in Textile Mills, J. J. Tyrrell. Textile World Jl., vol. 57, no. 6, Feb. 7, 1920, pp. 465-467, 3 figs. Installations in New England.

White System. The White Oil-Fuel System. Eng., vol. 10, no. 2844, July 2, 1920, pp. 23-24, 16 figs. partly on 2 supp. plates. Oil is forced into burners at pressure of from 60 to 90 lb. per square inch, and sprayed by mechanical action only. This system has been used in oil-fuel installations recently completed on Cunard liner Aquitania and White Star liner Olympic.

[See also FUELS, Coal vs. Oil; Liquid; PETROLEUM.]

OIL INDUSTRY

See PETROLEUM INDUSTRY.

OIL PIPE LINES

See PIPE LINES, Oil-Transmission.

OIL PUMPING

Air-Lift System. The Air-Lift System of Raising Oil, R. Stirling. Petroleum World, vol. 17, no. 237, June 1920, pp. 236-241. Some advantages of system are said to be that wells may be in any relative positions to one another so long as they can be reached by the air main or branches; air compressors are simple and durable machines, and power to drive them may be steam, gas, oil or electricity. Results of experiments at over fifty wells. Abstract of paper read before Instn. Petroleum Technologists.

Compressed-Gas. The Raising of Petroleum by Means of Compressed Gas (Das Fördern des Erdöles mittels verdichteter Gase), Michael Nikiel. Rohölindustrie, vol. 10, no. 12, Dec. 1919, pp. 215-218, 13 figs. Description of small-diameter pipes for raising the oil from bore holes.

OIL PUMPS

Force-Feed. The Hansa Force-Feed Oil Pumps and Oil Control Apparatus (Die Hansa-Druckschmierpumpen und Oelkontrollapparate). Motorwagen, vol. 22, no. 36, Dec. 31, 1919, pp. 701-703, 3 figs. Description and illustrations of a simple design of valveless piston pump and a visible oil controller, both patented by the Hansa Metal Works of Stuttgart-Feuerbach.

OIL SHALES

Brazil. Oil-Shales and Petroleum Prospects in

Brazil, Horace E. Williams. Min. & Metallurgy, no. 165, Sept. 1920, pp. 22-23. States that Brazil has enormous oil resources in rich oil-shales in different parts of the country, only suitable processes for extraction of oil are lacking. (Abstract.)

Colorado. Oil Shales of DeBeque, Col., G. Robert DeBeque. Eng. & Min. Jl., vol. 109, no. 5, Jan. 31, 1920, pp. 348-353, 3 figs. Geology and properties of deposits, with notes on retorting and refining problems to be solved in their exploitation.

Physical and Chemical Data on Colorado Oil Shale, Martin J. Gavin and Leslie H. Sharp. Eng. & Min. Jl., vol. 110, no. 12, Sept. 18, 1920, pp. 579-580. Results of recent work by government investigators on density, heat of combustion, thermal conductivity, analyses, specific heat, and oil yield of representative sample of massive rock. From U. S. Bur. of Mines, Reports of Investigations.

Distillation. Manufactured Gas Process of Extracting Oil from Shale Results in Maximum Yield of Oil and the By-Product, Sulphate of Ammonia, E. G. Church. Am. Gas Eng. Jl., vol. 112, no. 7, Feb. 14, 1920, pp. 117-119. It is said that submitting shale oil to that process results in high yield of gasoline, lubricating oil and high-melting-point paraffin.

The Oil Shale Industry, Victor C. Alderson. Quarterly Colo. School of Mines, vol. 14, no. 4, Oct. 1919, pp. 3-15, 1 fig. Proposed operations for distillation of oil shales and refining of products.

England. See Scotland.

Industry. Possibilities of the Oil-Shale Industry, H. M. Roeschlaub. Eng. & Min. Jl., vol. 108, no. 14, Oct. 4, 1919, pp. 572-576, 3 figs. Notes on differences between American and foreign practice and relative value of oils and by-products.

Ireland. See Scotland.

Johns Extraction Process. The Johns Process of Shale Oil Extraction. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, p. 313, 1 fig. Process is continuous and utilizes raw shale pulverized to such degree of fineness as permits maximum efficiency of handling prior to retorting and quick penetration of heat to all parts of bulk material in retort.

Kiln Distillation. The Eventual Retort Plant for the Distribution of Oil Shales, Louis Simpson. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 71-72. Alleges that horizontal revolving kiln, as constructed for burning of cement clinker, is more capable of handling spent shale than Scotch retort.

New Brunswick, Retort Test of. Report on Test of New Brunswick Oil Shales in the Wallace Retort. Chem. & Metallurgical Eng., vol. 22, no. 17, April 28, 1920, pp. 809-810, 2 figs. Retort for carbonization of coal and retorting of oil-bearing shales invented by W. G. Wallace. Essential idea is removing volatile products without subjecting them to temperature higher than that at which they are liberated from shale. Design is said to secure advantages of low-temperature distillation in that volatile products are given off at minimum temperature, immediately cooled and removed from influence of heat.

Nitrogen from. Recovery of the Nitrogen Contained in Oil Shales, Louis Simpson. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 20-22. Writer believes that future of oil shale industry is largely dependent upon construction of "single purpose" retort that can be erected at low cost and which will recover maximum quantity of oil.

Research in. The Necessity for Research in the Oil-Shale Industry, Martin J. Gavin. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 489-495, 4 figs. Account of shale oil industry as developed in Scotland. Steam-regulated pyrolytic distillation. Quality and quantity of oil yields.

Retorting. Oil Shale Retorting, Martin J. Gavin and Leslie H. Sharp. Natural Gas and Gasoline Jl., vol. 14, no. 7, July 1920, pp. 211-212. Investigations of the fundamentals of oil shale retorting with the coöperation of the State of Colorado.

Scotland. Irish and Scottish Oil Shale. Eng. & Min. Jl., vol. 108, no. 21, Dec. 6, 1919, pp. 872-873. Geological and mineralogical character of deposits and estimation of reserves.

The Oil Shale Industry in Scotland and England, Victor C. Alderson. Quarterly Colorado School of Mines, vol. 15, no. 4, Oct. 1920, pp. 5-17. Characteristics of deposits. Methods of treating shales.

Utilization. The Oil Shale Industry in Scotland and England. Am. Gas Eng. Jl., vol. 113, no. 14, Oct. 2, 1920, pp. 255-260 and p. 265. Analyzes methods employed abroad and bases suggestions on these findings for utilization of American shales.

OIL STORAGE

See PETROLEUM, Storage.

OIL TANKS

Concrete. Concrete Fuel Oil Storage Tanks. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 881-883, 4 figs. Procedure to be followed in their construction.

Construction. Oil Tank Construction (Ueber Reservoirbau), Carl Wadas. Petroleum, vol. 15, nos. 21 and 22-23, Apr. 2 and 12-19, 1920, pp. 793-796 and 833-836, 14 figs. Details of foundation, steel construction of floor, walls and tops, heating coils, the Wadas heating device, etc.

Fuel-Oil. Concrete Fuel-Oil Tank Design and Construction. Cement & Eng. News, vol. 31, no. 12, Dec. 1919, pp. 37-38. Precautions to be observed in building small oil-storage reservoirs for use in industrial plants.

Gage Sticks for, Calibrating. Slide-Rule for Calibrating Tank Gage Sticks. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 724-725, 2 figs. Description of a special slide-rule designed to facilitate work in calibrating gage sticks for ascertaining volume of oil contained in a cylindrical tank lying in horizontal position.

Protection Against Lightning. Protecting Oil Storage Tanks Against Lightning, Oliver Lodge. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 241-244. Opinion is expressed that metal tanks, not over-elevated and not specially earthed, with good joints and free from leaks, "are as safe as anything can well be, provided the roof and other parts are examined from time to time from the point of view of corrosion." From Petroleum World.

Reinforced Concrete. Concrete Oil Storage Tanks for Industrial Plants, J. E. Freeman. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 133-136, 4 figs. Experiments at Bureau of Standards are said to have established that oil of 30 deg. Baume or less can be successfully stored in untreated tanks. Structural details of such tanks are given.

Concrete Storage Tanks for Fuel Oil Square and Circular, R. E. Parker. Concrete, vol. 16, no. 5, May 1920, pp. 213-217, 11 figs. Two types, one circular and one rectangular, built by Aberthaw Construction Co., are illustrated and described.

Large Concrete Oil Tank Built for Panama

Canal, R. C. Hardman. Eng. News-Rec., vol. 84, no. 8, Feb. 19, 1920, pp. 380-381, 2 figs. Tank is 115 ft. in diameter and 30 ft. deep. Concrete was approximately 1:2:4 mix, proportions used at start of walls being one cement, 2¼ sand and 3¾ crushed stone. Steel stresses of 16,000 lb. per sq. in. were used. Capacity is 55,000 bbl.

Steel. New Design for Oil Tankage, H. T. Carlton. Eng. & Min. Jl., vol. 109, no. 19, May 8, 1920, pp. 1078-1079, 2 figs. Type developed by D. O'Hara and A. L. Shaw, of San Francisco involving suspended steel "arch," which has recently been patented.

[See also TANKS, Concrete.]

OIL WELLS

Casing for, Perforated. Perforated Casing and Screen Pipe in Oil Wells, E. W. Wagy. Dept. of Interior, Bur. of Mines, technical paper 247, 1920, 48 pp., 12 figs. Methods of applying perforating principle are described and their advantages and disadvantages discussed.

Casing Troubles. Casing Troubles and Fishing Methods in Oil Wells, Thomas Curtin. Dept. of Interior, Bur. of Mines, bul. 182, 1920, 48 pp., 24 figs. Classification of casing troubles and suggested solutions.

Drilling. Drilling an Oil Well in Pennsylvania, Herbert T. Wade. Sci. Am. Monthly, vol. 1, no. 6, June 1920, pp. 524-527, 6 figs. Methods of boring and details of machinery used.

Drilling and Rig-Building Data, Seth S. Langley. Eng. & Min. Jl., vol. 109, no. 7, Feb. 14, 1920, pp. 454-457, 3 figs. Data on drilling of oil wells in California.

Plant Used in the Percussion Systems of Drilling Oil Wells, Maurice A. Ockenden and Ashley Carter. Jl. Instn. Petroleum Technologists, vol. 5, no. 19, Apr. 1919, pp. 161-213 and (discussion) pp. 214-221, 17 figs. Writers draw attention to "necessity of extensive experience of those who undertake pioneer borings into new territory." Percussion systems now in use throughout the world are summarized into (1) American cable, (2) Canadian pole and cable, and (3) Russian free-fall. Specifications of tools employed in connection with each of these systems are given.

Plant Used in the Rotary System of Drilling Oil Wells, Maurice A. Ockenden and Ashley Carter. Jl. Inst. Petroleum Technologists, vol. 6, no. 23, July 1920, pp. 249-280 and (discussion) pp. 280-296, 18 figs. Historical account of development of hydraulic rotary system, and exposition of its advantages.

Rotary Rock Bits, Albert G. Wolf. Eng. & Min. Jl., vol. 109, no. 6, Feb. 7, 1920, pp. 404-407, 5 figs. Method used in drilling oil wells.

The Mechanics of the Oil Fields, Fred H. Colvin. Am. Mach., vol. 53, no. 15, Oct. 7, 1920, pp. 653-655, 9 figs. Equipment of use and operations involved in drilling an oil well.

Permits and Leases. Regulations Concerning Oil and Gas Permits and Leases (Including Relief Measures) and Rights of Way for Oil and Gas Pipe Lines. Dept. Interior, Gen. Land Office, no. 672, March 11, 1920, 38 pp. Rules and regulations prescribed for administration of provisions of act of Congress approved Feb. 25, 1920, entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas and sodium on the public domain."

Pumping. Oil Well Pumping Methods and Equipment, Seth S. Langley. Eng. & Min. Jl., vol. 109, no. 13, March 27, 1920, pp. 748-754, 7 figs. Details of equipment necessary and statement of costs in California.

Recementing. Recementing Through Tubing Under Pressure, C. C. Thoms. Cal. State Min. Bur., vol. 6, no. 1, July 1920, pp. 5-12, 1 fig. Describes procedure.

Water in. Analysis of Oil-field Water Problems, A. W. Ambrose. Min. & Metallurgy, no. 165, Sept. 1920, pp. 23-24, 1 fig. Claims that the underground losses of oil exceed by hundreds of thousands of barrels all the oil that has been lost in storage, transportation, or refining. Includes hypothetical sketch showing several possible waters in a producing oil field. (Abstract.)

OILS

Blended, Viscosity of. The Saybolt Viscosity of Oil Blends, Winslow H. Herschel. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1109-1112, 3 figs. Charts for determining oil blends of components of known viscosity, including logarithmic rule and correction factors to be applied in calculations, and tables of viscosities of blends containing 25, 50 and 75 per cent of heavier oil.

China Wood. China Wood Oil—Its Production and Preparation, D. Y. Lin. Pac. Mar. Rev., vol. 16, no. 12, Dec. 1919, pp. 74-75. Obtained from seeds of alurites which belong to spurge family.

Hydrogenation. Technical Application of Hydrogen in Hydrogenation or Hardening of Oils, Harry L. Barnitz. Chem. & Metallurgical Eng., vol. 22, no. 16, Apr. 21, 1920, pp. 745-748, 4 figs. Discussion of principles involved in saturating unsaturated oils by hydrogenation and commercial adaptability of method to industrial and edible oils; technology of process and schematic outline of apparatus used.

Linseed. Hexabromide Test for Determining Purity of Linseed Oil, Henry A. Gardner. Paint Manufacturers' Assn. of U. S., circular no. 99, July 1920, 16 pp. It is reported that Steele-Washburn method of determining hexabromides gave closely concordant results in hands of several different operators, and is therefore believed to be apparently well adapted for determining purity of raw linseed oil.

Mineral. See MINERAL OILS.

Paint. See PAINT OILS.

Soap-Water Emulsions. Separation of Fixed Oils from Soap-Water Emulsions, Eugene E. Ayres, Jr. Chem. & Met. Eng., vol. 22, no. 23, June 9, 1920, pp. 1057-1062, 2 figs. Study of phenomena exhibited by emulsions of oils in aqueous soap solutions; classification of emulsions; effects of dilution, salting and various physical forces and their possible application in oil-recovery processes.

Tung. Standards for Tung Oil, Henry A. Gardner. Paint Manufacturers' Assn. of U. S., circular no. 100, July 1920, 12 pp., 1 fig. Specifications adopted by Am. Soc. for Testing Materials. Heat tests of tung oils.

Vegetable. Putting the Vegetable Oil Industry on a Scientific Basis, Herbert S. Bailey. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 441-446, 3 figs. Outline of vegetable-oil and fat industry in which attention is directed to problems connected with production of crude oils and fats, laboratory and refining problems, and research opportunities in manufactured products.

[See also FATS, Catalytic Reduction of.]

OPEN-HEARTH FURNACES

Acid, Action of Iron Oxides on. The Action of Iron Oxides Upon the Acid Furnace Structure, J. H. Whiteley and A. F. Hallimond. Engineering, vol. 108, no. 2807, Oct. 17, 1919, pp. 528-532, 10 figs. Source of iron oxides carried from furnace by outgoing gases is considered and method is described by which comparative amounts present in gases at various

stages of process may be ascertained. Paper read before Iron and Steel Inst.

Automatic Door Hoist. A New Automatic Door Hoist for Open-Hearth Furnaces, H. A. Lewis and W. H. Burr. Jl. Engrs.' Club, Philadelphia, vol. 37-2, no. 183, Feb. 1920, pp. 43-46, 5 figs. By closing push button, shunt coil on one of contactors is energized, closing one of contacts, and as bottom of other contactor is in closed position motor starts and operates as long as circuit is held closed by operator.

Calculation of. See GAS PRODUCERS, Calculation of.

Design. Design of Furnaces and Ovens Is Factor in Cutting Costs in New Open-Hearth Plant. Iron Trade Rev., vol. 66, no. 13, Mar. 25, 1920, pp. 915-920, 8 figs. Features of furnaces to which attention is particularly directed are cooling of furnace doors with running water and their operation by compressed air, which is controlled by valve centralized at one station near wall in front of furnace, charge being brought from stock yard in charging boxes carried on flat-bottom cars, and complete record being kept of every heat.

Design of Open Hearth Furnaces, A. D. Williams. Iron Age, vol. 105, nos. 1, 2, 5, 7, 12, 18, 22, Jan. 1, 8, 29, Feb. 12, Mar. 18, Apr. 29, May 27, 1920, pp. 35-37, 119-120, 317-320, 475-477, 805-806, 1225-1226, 1510-1511, and vol. 106, no. 6, Aug. 5, pp. 319-321, 28 figs. Jan. 1: Lack of rationale in existing constructions pointed out and studies made by Groume-Grjimailo and others surveyed. Jan. 8: Conditions governing flow of burning gases along hearth. Jan. 29: Arrangement of ports for different fuels, variation in areas and the matter of furnace roof. Feb. 12: Graphical comparison of volume of air plus gas checker brickwork in cubic feet per ton of nominal capacity for furnaces of various capacities. Mar. 18: Bearing of time factor on thickness of checker brick is illustrated by graph showing rise in temperature on medium line of fireclay brick in percentage of surface temperature. Apr. 29: Heat-capacity curves of producer gas, various air supplied and their products of combustion, together with curves indicating calorific intensity as affected by various degrees of preheating of air, gas, and of both air and gas. May 27: Examples of vertical and horizontal types. Aug. 5: Waste heat boiler installations. Calculations involved and questions of setting and draft. Records of tests.

France. The Tilting Open Hearth's Future in France. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1499-1500. Superiority of basic open-hearth steel over basic bessemer steel is pointed out and increasingly large demand in Europe for former kind of material is noted. Translated from Revue de Métallurgie.

Gas-Fired. The Heating of Open-Hearth Furnaces with a Mixture of Blast-Furnace and Coke-Oven Gases (Ueber die Beheizung von Martinöfen mit einem Gemisch aus Hochofen- und Koksotengas), Adolf Schneider. Stahl u. Eisen, vol. 40, no. 15, Apr. 15, 1920, pp. 501-506 and (discussion), pp. 506-510, 2 figs. Description of a patented process of the Dortmund Union for production of carbon steels and alloyed special steels in tilting open-hearth furnaces by use of a mixture of low-grade and high-grade gas. In this process the bath is heated to such an extent that a slag of such high basicity and reaction capacity is formed that phosphorus and sulphur enter into it and through dumping of slag, are almost entirely removed without reduction of carbon content and without loss of the additions of chromium, nickel, wolfram, etc. Report from Steelwork Committee of Assn. German Foundrymen.

The Heating of Open-Hearth Furnaces with Lignite Producer Gas (Die Beheizung von Martinöfen mit Braunkohlengeneratorgas), Stahl u. Eisen, vol. 40, no. 17, Apr. 29, 1920, pp. 565-567 and (discussion) pp. 567-568. It is pointed out that in gasification of briquets in producers, special attention should be given to clinker, and addition of steam is necessary to insure good quality of gas and to maintain an even, not too high temperature, which is also necessary for production of tar. Report from steelworks committee of Assn. German Foundrymen.

Heat Economy, Improving. Improvement of Heat Economy in Furnaces, Especially Open-Hearth Furnaces (Verbesserung der Wärmewirtschaft von Ofenfeuerungen, insbesondere von Martinöfen), W. Tafel. Stahl und Eisen, vol. 39, no. 43, Oct. 23, 1919, pp. 1280-1283, 1 fig. Showing various means for avoiding or utilizing heat losses; suggestions for preventing explosions in Siemens Martin furnaces when connected with boilers.

Large-Unit Practice. Open Hearth Practice with Large Units, N. E. Maccallum. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 52-55, 6 figs. Double ladle practice is upheld. Experience with Metalkase brick is illustrated.

Scotch Practice. Basic Open Hearth Practice in the West of Scotland, Andrew Gray and R. Percival Smith. Jl. West of Scotland Iron & Steel Inst., vol. 27, part 1, Oct. 1919, pp. 8-13 and (discussion) pp. 13-17. Surveys development of industry during latter half of nineteenth century, and discusses reactions of importance that take place on a basic hearth.

Siemens-Martin. Siemens-Martin Furnaces (Les fours Siemens-Martin), A. D. Williams. Revue de Métallurgie, vol. 16, no. 5, Sept.-Oct. 1919, pp. 313-339, 16 figs. Survey of technical and experimental researches of various investigators, undertaken with a view to determine best proportion of dimensions of furnaces, together with exposition of physical phenomena taking place in furnace.

Tilting Type. Tilting Open-Hearth Furnaces (Kippbare Martinöfen), Fr. Dittmer. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 51, Dec. 20, 1919, pp. 1287-1288, 3 figs. Discusses importance of these furnaces for steel works and copper smelters, and points out their advantages over the fixed type. In spite of their higher cost writer believes that they should be installed in all new plants.

Waste-Heat Utilization. Steel Plant Power Generation from Waste Heat and Coal, B. H. Greene. Assn. of Iron & Steel Elec. Engrs., Jan. 1920, pp. 25-37, 3 figs. Writer presents some practical problems encountered in utilization of waste heat from open-hearth furnaces for generation of power for steel mill use. Description of an installation, wherein steam derived from waste heat was supplemented by coal-fired boilers and used for electric power generation.

OPEN SHOP

See INDUSTRIAL RELATIONS, Open Shop.

OPTICS

Astigmatism. Universal Method of Measuring and Compensating Astigmatism of Optical Lenses (Sur une méthode universelle de mesure et de compensation de l'astigmatisme instrumental), Jacques Carvallo. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 19, May 10, 1920, pp. 1109-1112. Following theorem is established: Two astigmatic elements can be disposed along the same optical axis so as to form an anastigmatic system, when their principal planes of astigmatism are at right angles to each other and if their astigmatisms are inversely proportional

to the squares of their distances from the intermediary image.

Resonance Radiation and Spectra. Researches in Physical Optics, R. W. Wood. Columbia Univ. in the City of New York, Publication No. 8, of the Ernest Kempton Adams Fund for physical research, established Dec. 17, 1904, 184 pp., 80 figs. partly on 100 supp. plates. Resonance radiation and resonance spectra.

Tyndall Light. Depolarization of Tyndall Light (Depolarización de la luz de Tyndall), Ricardo Gans. Contribución al estudio de las sciencias, físicas y matemáticas Universidad Nacional de la Plata, no. 38, Dec. 1918, pp. 233-250 and 275-285, 6 figs. Pp. 233-250: Equations for determining degree of depolarization produced in extremely weak solutions of non-spherical particles. Pp. 275-285: Calculation by means of amicrons of colloidal silver.

[See also EYE, Contrast Sensibility of; LIGHT; REFLECTIVITY; REFRACTION.]

OPTOPHONE

Reading by Sound. The Optophone. Elecn., vol. 85, no. 2204, Aug. 13, 1920, pp. 183-184, 2 figs. Apparatus for reading by sound. Light from lamp placed behind rotating disk perforated with small holes in concentric circles falls on printed letter and is reflected on to selenium bridge. Light falling on letter forms five spots in line. Part of light reflected to selenium varies with shape of letter. Light impulses received at selenium bridge originate sound pulsations in telephone receiver connected in series with bridge.

The Optophone: An Instrument for Reading by Ear, E. E. Fournier d'Albe. Nature, vol. 105, no. 2636, May 6, 1920, pp. 295-296, 4 figs. Line of luminous dots is thrown on optical system on ordinary print, each dot having different musical frequency. Light constituting these dots is reflected back on to selenium which is put in circuit with battery and high-resistance telephone receiver. Those falling on white paper produce musical note, those falling on black are extinguished.

ORDNANCE

A. E. F. Machine Shop, France. A Pioneer Ordnance Machine Shop, H. D. Parker. Am. Mach., vol. 51, no. 22, Dec. 11, pp. 1003-1008, 7 figs. Description of first machine shop at Advance Ordnance Depot, No. 1, Is-Sur Tille, France, and construction work done by American engineers and ordnance men.

Manufacturing. Machining Problems Solved in Gun Making. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 949-952, 17 figs. Tooling processes devised to obtain requisite accuracy in heavy pieces of ordnance.

U. S. Naval Plant. U. S. Naval Ordnance Plant, Charleston, W. Va., W. L. Ainsworth. U. S. Naval Inst. Proc., vol. 46, no 204, Feb. 1920, pp. 237-243, 1 fig. General layout of plant for construction of armor plate and major-caliber gun forgings.

[See also AMMUNITION; CANNON; HOWITZERS; MACHINE GUNS.]

ORE BINS

Design. See CHUTES, Design.

ORE CONCENTRATION

Machine for. A New Machine for Concentrating Minnesota Wash Ores, Edward W. Davis. Bul. University of Minnesota, vol. 22, no. 56, Dec. 16, 1919, 32 pp., 5 figs. It is concluded from tests that Dorr classifier equipped with submerged trommel will produce practically same results as are secured in standard log-washing plants.

[See also FLOTATION.]

ORE CRUSHERS

See CRUSHERS.

ORE DEPOSITS

Utah. See MINERALS, Deposits, Utah.

Washington State. Dominant Features Controlling Ore Deposits of Washington, Ernest N. Patty. Eng. & Min. Jl., vol 110, no. 10, Sept. 4, 1920, pp. 467-470, 3 figs. Formations genetically related to batholithic intrusions of granitic rocks. Associated with dikes in Stevens and Northern Pend Oreille Counties. Near marginal contacts at some other points. Ores of Republic district excepted.

[See also under names of various metals.]

ORE DRESSING

Ball Mills. Application of Ball Mills in Southeast Missouri, Lewis A. Delano and Harold Rabling. Min. & Metallurgy, no. 163, July 1920, pp. 34-35. Results of tests showed that when ball mills are used to crush jig tailings, practically the same recovery is obtained as without the jigs, and the concentrates contain considerably less slime lead; as results of investigations, the jigs are being removed from the Bonne Terre mill. (Abstract.)

Fine-Grinding in Ball-Mills, Henry Hanson. Min. & Sci. Press, vol. 120, no. 1, Jan. 3, 1920, pp. 17-20. Results of comparative tests.

Classifier Efficiency. Classifier Efficiency, R. T. Hancock. Eng. and Min. Jl., vol. 110, no. 13, Sept. 25, 1920, pp. 622-623. Improvement over former methods of determination suggested. Elutriation preferable to screening tests.

Progress in 1919. Recent Progress in Ore Dressing, E. H. Robie. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 200-202. Development during year is described as having tended more to improvement and application of processes rather than to development of machinery.

ORE HANDLING

Automatic Unloader. Improvement in Bulk Cargo Handling. Iron Age, vol. 106, no. 7, Aug. 12, 1920, pp. 385-387, 3 figs. Fifteen-ton bucket automatic ore unloader and 100-ton car dumper for Atlantic Coast.

Unique Ore Unloader for Lake Steamers. Mar. Eng. and Can. Merchant Service Guild Rev., vol. 9, no. 11, Nov. 1919, pp. 369-371, 4 figs.; also Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 735-737, 5 figs. W. S. M. automatic ore unloader. It consists of main frame work mounted on trucks which travel along runway rails. Two operators control unloading, weighing and delivery of ore.

Railway Spreader Car. Railway Spreader Car Handles Heavy Materials. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 866-867, 4 figs. Dumped iron ore and stripping spread by wings and plows pneumatically operated on car pushed by locomotive.

ORE SAMPLING

Methods. Mechanical Ore Sampling in Montana, H. B. Pulsifer. University of Montana Bul., no. 3, March 1920, 72 pp., 30 figs. Sampling, it is said, is carried on extensively in seven sampling mills and in at least five large and important ore-dressing mills. Procedure used in the different sampling mills is outlined.

Underground. Underground Sampling, Walter G. A. Smith. Australasian Inst. Min. & Metallurgy, no. 36, Dec. 31, 1919, pp. 75-87, 3 figs. Methods at Great Cobar copper and gold mines, Cobar, New South Wales, Australia.

ORE TREATMENT

Separation. Notes on the S. and M. Mine and on Treatment of Bismuth, Tin, and Wolfram Ores, Wm. E. Hitchcock and J. R. Pound. Proc. Australasian Inst. Min. & Metallurgy, no. 35, Sept. 30, 1919, pp. 33-73. Account of mechanical separator and discussion of conditions necessary for satisfactory working.

[See also CONCENTRATION.]

ORES

Density Determination. Density Determination of Semi-Hard Ores, R. H. McHardy. Eng. & Min. Jl., vol. 110, no. 2, July 10, 1920, p. 65, 2 figs. Describes modified method of determining density factor devised for purposes of estimating tonnage of iron ore removed from drifts and raises at Harold mine, Hibbing, Minn., and used instead of so-called "oats" method, which is also described.

Polarized Light, Study by. Polarized Light in the Study of Ores and Metals, Fred E. Wright. Proc. Am. Philosophical Soc., vol. 58, no. 7, 1919, pp. 401-447, 12 figs. Attempt is made to present in connected form electromagnetic theory of reflection of light by absorbing media and specially that part of theory which treats of reflection phenomena resulting from vertically incident light waves under conditions encountered in use of reflecting or metallographic microscope. Use of immersion liquids and monochromatic light source is suggested for obtaining greatest differences in intensity between reflected components, thereby increasing sensitiveness of methods for detecting anisotropism.

Pulverized, Analysis of. Approximate Quantitative Microscopy of Pulverized Ores, Will H. Coghill and J. P. Bonardi. Dept. of Interior, Bureau of Mines, tech. paper 211, 1919, 20 pp., 3 figs. Improvement suggested consists in substituting binocular instrument for monocular instrument.

ORGANIC COMPOUNDS

Electrochemical Production. Commercial Possibilities in the Electrochemical Production of Organic Compounds, C. J. Thatcher. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 663-666. Particularly study of conditions favoring economy in operation, catalytic effect, diaphragms and suggestions in regard to effecting organic electrosynthesis.

ORGANIZATION

Foundry. See FOUNDRIES, Organization.

Industrial. See INDUSTRIAL ORGANIZATION.

Office. See OFFICE MANAGEMENT.

ORSAT APPARATUS

See FLUE-GAS ANALYSIS, Orsat Apparatus.

OSCILLATIONS

Acoustic. See Electric and Acoustic.

Damped. Damped Oscillations in Coupled Circuits, G. Bramwell Ehrenborg. Radio Rev., vol. 1, nos. 5, 7 and 8, Feb., April and May 1920, pp. 220-224, 329-336 and 375-380, 7 figs. Mathematical study of oscillation in two circuits electromagnetically coupled.

Mass Damping (Massendämpfung), O. Martienssen. Zeitschrift für Instrumentenkunde, vol. 39, no. 9, Sept. 1919, pp. 265-273, 12 figs. Describes method for damping mechanical oscillations, by which a mass in the oscillating body is displaced by expenditure of energy. Theory of damping is presented which, the writer says, makes it possible to calculate dimensions necessary to obtain a desired damping.

Electrical. Absolute Value of Periods of High-Frequency Electric Oscillations (Mesure en valeur absolue des périodes des oscillations électriques de haute fréquence), Henri Abraham and Eugene Bloch. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 237-302, 11 figs. Period is determined by rendering it identical to that of harmonic of electric oscillator, fundamental frequency of which can itself be made identical to that of a standard tuning fork.

Oscillations Obtained by Coupling a Secondary Circuit with a Continuous Wave Valve Oscillator, J. S. Townsend. Radio Rev., vol. 1, no. 8, May 1920, pp. 369-374, 6 figs. Equations expressing frequencies of free oscillations when two oscillatory circuits are coupled by mutual induction between coils.

Electric and Acoustic. Determination of the Frequency of Acoustic and Electric Oscillations with the Aid of the Beat Method (Ueber die Bestimmung von Schwingungzahlen akustischer und elektrischer Schwingungen mit Hilfe der Schwebungsmethode), R. Weller. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 6, Nov. 1919, pp. 599-608, 3 figs. Methods in use for determining frequency of acoustic and electric oscillations are described as (1) comparison with monochord by means of beats, (2) excitation of stationary vibration in tubes according to Kundt and Quincke, and (3) determination of length of waves of an electric vibration circuit from self-induction and capacity according to the Thomson formula. To these, writer adds a method for determining vibration frequency by use of tube transmitters which, though not as exact as above mentioned methods, is said to be useful and serviceable for simple and rapid control. Report from the Laboratory of the Technical Department for Wire Apparatus, Jena.

Electromagnetic. A Method of Amplifying Electrical Variations of Low Frequency, W. H. Eccles and F. S. Jordan. Elecn., vol. 85, no. 2204, Aug. 13, 1920, p. 176, 4 figs. Method consists of impressing upon a source of oscillations at frequency of amplifier the lower frequency fluctuations to be magnified, and then passing the modulated carrier oscillations through the amplifier, which magnifies them as modulated.

On the Propagation of Maintained Electrical Oscillations in Water, and the Dielectric Constant of Water (Sur la propagation dans l'eau d'oscillations électriques entretenues, et sur la constants diélectrique de l'eau), M. Sauzin. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 3, July 19, 1920, pp. 164-167. Determination of dielectric constant of water by means of phenomena produced by electrical oscillations maintained by three-electrode valve. Value found for dielectric constant of distilled water was 73.

Frequency, Absolute Measurement of. The Mandelstam Method of Absolute Measurement of Frequency of Electrical Oscillations, J. Tykocinski-Tykociner. Lond., Edinburgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 39, no. 231, March 1920, pp. 289-294, 3 figs. Method depends on phenomenon observed by Dr. Mandelstam, while investigating behavior of high-toned buzzers, namely, that oscillations in circuit energized by a buzzer do not depend solely on its capacity and inductance, but depend also upon frequency of pulsating current delivered by buzzer and to large extent upon character of its interruptions.

High-Frequency. An Oscillographic Study of a Howler Set, Lindley Pyle. Telegraph & Telephone Age, no. 22, Nov. 16, 1919, pp. 554-555, 6 figs. Operation of device used for sustaining high-frequency oscillations of order of 1000 cycles per sec. From Wash. Univ. Studies.

Linear-Sinoidal. The Theory of Linear-Sinoidal Oscillations, Henry G. Cordes. Physical Rev.,

vol. 16, no. 3, Sept. 1920, pp. 179-201, 8 figs. Theory is developed which indicates that efficient arc oscillations can be produced by providing constant frequency priming spark.

Maintained. Systems of Maintained Oscillations, With Special Reference to Oscillations Maintained by Self-Excitation (Sur les systèmes a oscillations persistantes, et en particulier sur les oscillations entretenues par auto-amorçage), André Blandel. Jl. de Physique théorique et appliquée, vol. 9, April and May 1919, pp. 117-151 and pp. 153-262, 16 figs. Equations are derived from Hurwitz theorem, which express analytical conditions of excitation and maintenance.

[See also IONIC VALVES, Oscillations; RADIOTELEGRAPHY, Oscillations.]

OSCILLOGRAPHS

Portable. Portable Oscillograph, J. W. Legg. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 674-679, 9 figs. Lamp and film motor are operated from small transformer which may be plugged into any ordinary lamp socket or power supply of approximately 110 or 220 volts at any frequency from 20 to 70 cycles.

OSMOSIS

Electrical Commercial Applications. The Commercial Application of Electrical Osmosis, John S. Highfield, W. R. Ormondy and D. Northall-Laurie. Jl. Royal Soc. of Arts, vol. 68, no. 3527, June 25, 1920, pp. 514-520 and (discussion) pp. 521-523, 12 figs. Describes electrical method and apparatus for commercial purification of clay; and the electro-osmotic filter press, developed for dewatering and purifying many substances in a finely divided state.

OVENS

Drying, Electrically Heated. See HEATING, ELECTRIC, Drying Ovens.

OVERVOLTAGE

Hydrogen. See CATALYSIS, Overpotential.

OXALIC ACID

Manufacture. Factors in the Conversion of Sodium Formate to Oxalate, E. H. Leslie and C. D. Carpenter. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920, pp. 1195-1197, 1 fig. Study of temperature, pressure and caustic composition factors influencing percentage of conversion of sodium formate to oxalate.

OXY-ACETYLENE CUTTING

Cutting Machines. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 53, no. 2, July 8, 1920, pp. 54-59, 19 figs. Principal types and makes of cutting machines.

Iron and Steel. Metallography of Iron and Steel as Related to Cutting with Oxygen, F. J. Napolitan. Metal Trades, vol. 11, no. 8, Aug. 1920, pp. 325-326. Account of experience in cutting iron and steel of different carbon compositions at Eng. & Research Laboratory of Davis-Bournonville Co.

Manhole-Cutting Machine. Oxy-Acetylene Manhole Cutting Machine. Eng., vol. 109, no. 2836, May 7, 1920, p. 606, 4 figs. Machine constructed by Davis-Bournonville Co., Jersey City, for repetition cutting of manholes to template.

Plate Cutting. Cutting 720 Lineal Feet of ½-Inch Steel Plate an Hour with One Torch, Fred J. Maeurer. Welding Engr., vol. 4, no. 11, Nov. 1919, pp. 44-51, 18 figs. Special torch used, which swung freely on post of machine, and spring attached to post and torch to keep torch against template, so that while radiagraph would run on straight tracks, spring would hold torch to template, making cut as laid out on drawings.

Radiagraph. Cutting of Steel Plates, Castings and Billets, J. H. Moore. Can. Machy., vol. 24, no. 10, Sept. 2, 1920, pp. 225-229, 11 figs. Construction and operation of radiagraph manufactured by Davis-Bournonville Co., Jersey City, N. J.

Torches. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 52, no. 25, June 24, 1920, pp. 1343-1346, 12 figs. Notes on cutting with gas torch. Gives tables of gas pressures and cutting speeds, and directions as to how to use torch and cut metal.

Under Water. Autogenous Cutting Under Water (Autogenschneiden unter Wasser). Autogene Metallbearbeitung, vol. 13, no. 5, Mar. 1, 1920, pp. 54-58, 8 figs. States that the Larsen sheet piling and a described method of cutting under water can be used wherever large cofferdams are required instead of the costly double-wall wooden cofferdams.

[See also OXYGEN CUTTING.]

OXY-ACETYLENE WELDING

Accident Prevention. Hazards in Gas Welding and Cutting. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 892-895, 4 figs. Prepared by Eng. Dept. of Nat. Safety Council.

Acetylene Production. How Can the Quality of Autogenous Welding Be Improved? (Wie Kann Man die autogene Schweissung qualtativ Verbessern). Acetylen, vol. 22, no. 17-18, Sept. 1919, pp. 67-73. Writer maintains that acetylene employed for autogenous welding should be as free of water as possible and, in order to accomplish this, advises production of acetylene with low temperature, and increase of pressure under which acetylene reaches burner.

A. E. F., France. Oxy-Acetylene Welding in the A. E. F., C. E. Lester. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 465-469, 14 figs. Work done by Transportation Corps in Nevers shops in France.

Aluminum. See ALUMINUM, Welding.

Applications. The Rapid Repair of Machinery Equipment by the Autogenous Cutting and Welding Process (Beschleunigte Ausbesserungen von maschinellen Einrichtungen durch das autogene Schneid- und Schweissverfahren), A. Nolte. Stahl u. Eisen, vol. 40, no. 21, May 27, pp. 713-717, 17 figs. Writer gives examples of practical application of this process in works under his superintendence.

Automobiles. Autogenous Welding in the Citroen Automobile Factory (Die autogene Schweissung in der Automobilfabrik Citroen). Autogene Metallbearbeitung, vol. 13, no. 11, June 1, 1920, pp. 118-124, 3 figs. Includes illustrations of auxiliary welding devices and of the numerous welded automobile parts. From report of the Swiss Acetylene Assn.

The Welding of Automobile Frames, W. B. Perdue. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 473-475. Discussion of difficulties encountered and methods used to overcome them.

Blowpipe Manipulation. Blowpipe Manipulation, Capt. D. Richardson. Acetylene Jl., vol. 21, no. 12, June 1920, pp. 786-788, 8 figs. Method of executing welds. From London Acetylene and Welding Jl.

Blowpipe Manipulation. A New Method of Executing Welds. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, pp. 218-219, 3 figs. Executing welds by method in which welding rod follows blowpipe instead of preceding it.

Boiler Repairs. Autogenous Welding Accepted in

Boiler and Pressure Vessel Repairs. Boiler Maker, vol. 20, no. 1, Jan. 1920, pp. 17-18. Committee report of Engineers' Committee of Steam Boiler and Fly-Wheel Service Bur. which was made up of representatives from all companies writing steam boiler insurance.

Autogenous Welding and the Steam Boiler, T. H. Fenner. Power House, vol. 13, no. 6, Mar. 20, 1920, pp. 134-136 and 143, 7 figs. Examples of firebox-sheet failures are given, together with rules of Steam Boiler and Fly Wheel Service Bureau, New York, organization which includes engineering staffs of large insurance companies of North American continent.

Boiler Repairs by Oxy-Acetylene Welding. Acetylene & Welding Jl., vol. 16, nos. 193, 194 and 195, Oct., Nov. and Dec. 1919, pp. 190-192, 214-215 and 240-241, 14 figs. Describes and illustrates welding back and front plates of fireboxes and cracks in side sheets of fireboxes.

Burners. Improvements in Spray Burners for Welding and Cutting Metals. Acetylene & Welding Jl., vol. 16, no. 191, Aug. 1919, pp. 157-158, 1 fig. Apparatus is arranged so as to permit soaking and spraying liquid fuel with burner tube by oxygen introduced by pressure.

Castings. See FOUNDRIES, Welding, Applications of.

Cast Iron. Gas Welding of Cast Iron, C. K. Bryce. Welding Engr., vol. 5, no. 8, Aug. 1920, pp. 25-27. Precautions to be taken for securing good welds. Paper read before American Welding Society.

Cast-Iron Repair. Welding Repairs in Textile Mills, J. F. Springer. Textile World Jl., vol. 57, no. 10, Mar. 6, 1920, pp. 115-117, 4 figs. Writer calls attention to several matters which he terms of importance in cast-iron repair, namely, (1) preparation of surfaces which are to be united, (2) arrangement of work, (3) provision of proper welding rod, (4) adjustment of torch, (5) manipulation of rod and torch, and (6) finishing job after welding.

Characteristics of Welds. Characteristics Peculiar to Oxy-Acetylene Welds, Alfred S. Kinsey. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 23-24. One of characteristics noted is its applicability to all kinds of metals. Paper read before Joint Meeting, New York Section Am. Soc. M. E. and Am. Welding Soc.

Colliery Uses. Oxyacetylene Process in Collieries and Shops, Charles C. Phelps. Coal Age, vol. 16, nos. 22 and 23, Dec. 18 and 25, 1919, pp. 887-890, 9 figs., and 930-933, 12 figs. Introduction is said to have brought about reduction in number of spare parts needed. Illustrates use of torch in cutting rails, welding pipe lines, etc.

Drop Forgings. Fusion Welding Applies to Drop Forgings, S. W. Miller. Can. Machy., vol. 23, no. 3, Jan. 15, 1920, pp. 92-93. Writer holds that oxy-acetylene process is more applicable to reclaiming of drop forging than electric, especially where defects are small, because "while the electric process is considerably cheaper . . . yet there is greater liability with the electric process."

Engine Bedplate. Oxyacetylene Promptly Clears Shaft and Repairs Engine Bed after an Overwind, Charles C. Phelps. Coal Age, vol. 17, no. 23, June 3, 1920, pp. 1131-1134, 9 figs. As result of overwind, bedplate of hoisting engine was broken and its foundation bolts were sheared. Two bailing buckets, several hundred feet of rope and an 8-in. pipe were wedged together at bottom of shaft. Repairs were made by means of oxyacetylene torch.

Engine Cylinders. Repairing Motor Cylinders by Autogenous Welding (Ueber die Ausbesserung schadhafter Motorzylinder mittels der autogenen Schweissung). Autogene Metallbearbeitung, vol. 12, no. 7, July 1919, pp. 115-119, 10 figs. Repairing cracks in motor cylinders.

The Making and Welding of Engine Cylinders. Practical Engr., vol. 60, no. 1707, Nov. 13, 1919, pp. 233-234, 8 figs. American patent relating to welding elbow-like members of gas passages leading to or from inlet or exhaust ports to cylinder.

Welding Large Mill Engine Cylinders, L. M. Malcher. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 908-909, 5 figs. Repairing 70-in. cylinder of Allis-Chalmers twin tandem-compound engine. Also in Iron Trade Rev., vol. 65, no. 26, Dec. 25, 1919, pp. 1710-1711, 5 figs.

Welding Locomotive Cylinders. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 932-933. Symposium presented at convention of Int. Ry. Gen. Foremen's Assn.

Eye Protection. Protecting the Eyes of Welders. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, pp. 222-224, 5 figs. Invention relating to screen of suitably colored glass which is interposed between acetylene blowpipe and operator.

Filling Blowholes. Oxy-Acetylene Welding Methods. Automotive Manufacturer, vol. 61, no. 6, Sept. 1919, pp. 25-26, 2 figs. Filling blowholes and other cavities.

Forge Work. Fusion Welding as Applied to Forge Work, S. W. Miller. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 20-22. Oxy-acetylene process is preferred to electric process for fusion welding because "while the electric process is considerably cheaper, . . . there is greater liability with the electric process of not getting thorough fusion at the beginning of the work." Paper read before Am. Drop Forge Assn.

Foundry Work. The Welder in the Iron Foundry, David Baxter. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 410-416, 2 figs. Applications of welding in foundry, with instructions for doing various classes of work.

Fractures. Metallurgy for Welders, Paul C. Tris. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 480-482. Photomicrographs illustrating various conditions which are likely to be found in fractures.

French Practice. A New Method of Welding. Sci. Am. Monthly, vol. 1, no. 6, June 1920, p. 522, 3 figs. French system of holding welding rod to rear of torch. Translated from Revue de la Soudure Autogène.

Oxy-Acetylene Industry in France, Paul Pleiss and C. V. Price. Welding Eng., vol. 4, no. 11, Nov. 1919, pp. 21-25. Practices of various companies in regard to charging acetylene generators, pressures used, etc. Comparing conditions with industry in United States writer says that outstanding difference is degree of coöperation that exists between manufacturers, users, and the French Welding Soc., who are all "united in their efforts to further the use of the process through the offices of the Welding Soc., and this spirit has been of tremendous import to the growth of the Industry in France."

Gas-Flow Indicator. See FLOW OF GASES, Flow Indicator.

Heavy Forgings. Oxy-Acetylene's Possibilities in Heavy Welding, J. G. Hill. Can. Machy., vol. 21, no. 23, Dec. 4, 1919, pp. 560-561. Cases are cited such as welding of section 18 in. by 40 in. of 70-ton frame of bull-dozer for piercing shelf forging. Paper read before Convention International Soc. Assn.

See also FOUNDRIES, Welding, Applications of.

Isolated Plant. Oxy-Acetylene Welding in an Isolated Plant, J. H. Stoliker. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 475-478. Conditions for successful welding. Paper read before Can. Natural Gas & Petroleum Assn.

Locomotives. Methods of Welding Locomotive Fireboxes, George L. Walker and R. T. Peabody. Boiler Maker, vol. 20, no. 3, Mar. 1920, pp. 59-63, 21 figs. Instructions for welding fireboxes by oxy-acetylene process.

Welding a High-Pressure Cylinder, Frank H. Frye. Welding Engr., vol. 5, no. 4, April 1920, pp. 28 and 32, 4 figs. Welding of high-pressure cylinder of Mallet Articulated Class AE Locomotive by Oxweld Acetylene process.

See also LOCOMOTIVES, Cylinders, Welding.

Machines for. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 769-772, 12 figs. Examples of welding machines built for straight-seam work, and also of types developed for circular or irregular seams.

Manufacturing Applications. Simplifying the Manufacture of Metal Products by Oxy-Acetylene Welding. Acetylene Jl., vol. 21, no. 8, Feb. 1920, pp. 535-536. Application of oxy-acetylene welding in manufacture of metal furniture, casement windows and metal doors, mangle rollers, angle elbows on smoke stacks, steam coils and surgical appliances is pointed out.

Navy Yards. Use of Acetylene in Navy Yards During the War, H. G. Knox. Acetylene Jl., vol. 21, no. 5, Nov. 1919, pp. 325-334, 17 figs. New York yard used about 110,000 cu. ft. per month; Charleston 15,000 cu. ft.; Norfolk, 60,000 cu. ft.; Boston 75,000 cu. ft. Applications are illustrated. Paper read before International Acetylene Assn.

Pipe. Oxyacetylene Gas Welding, Alfred S. Kinsey. Gas Age, vol. 45, no. 8, Apr. 26, 1920, pp. 331-335, 10 figs. Laying of pipe line near Philadelphia. Line is of standard 12-in. and 16-in. steel pipe, being double-piped for three miles and single-piped for five miles. Pipe joints were welded by oxyacetylene process.

See also PIPE, Welded Joints vs. Fittings.

Principles. Technical Engineer's Judgment of the Oxy-Acetylene Process, Alfred S. Kinsey. Acetylene Jl., vol. 21, no. 5, Nov. 1919, pp. 346-350. Fundamental principles involved in oxy-acetylene welding, which were not used in shop practice before introduction of this process. Paper read before International Acetylene Assn.

Procedure. Oxy-Acetylene Welding and Cutting, Hugh H. Dyar. Boiler Maker, vol. 19, no. 12, Dec. 1919, pp. 362-364. Concerning uniting of gases in torch, heat treatment of cast iron, uses of special jigs for tank welding, and strength of welds.

Processes. Manipulation in Welding, Capt. D. Richardson. Natural Gas and Gasoline Jl., vol. 14, no. 7, July 1920, pp. 207-209, 6 figs. A new method of executing welds by oxy-acetylene process described.

Rails. The Autogenous Welding of Rails, C. F. Keel. Welding Engr., vol. 4, no. 11, Nov. 1919, p. 29. Recommends welding base of rail and cutting out head by means of torch. Paper read before Swiss Acetylene Soc. Translated from Revue de la Soudure Autogène.

Repair Work. Mass Production in Repair Work. Motor Traction, vol. 30, no. 782, Feb. 23, 1920, pp. 178-180, 4 figs. Writer deals mainly with subject of welding operations, namely, equipment of stationary and portable oxy-acetylene plants, welding and reboring of castings and preparation of welded work for machining.

Safety Devices. Safety Devices for Use in Autogenous Metal-working (Sicherungen bei der autogenen Metallbearbeitung), P. Max Grenpe. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 11 and 13, Mar. 8 and Apr. 1, 1920, pp. 45-47 and 52-54, 4 figs. States safety regulations and describes arrangements for prevention of accidents used in the works of German General Elec. Co., including device for preventing standing steel bottles from falling over, carts for transporting them, etc.

Sheets, Heavy. Oxy-Acetylene Welding of Heavy Sheets, F. H. Sweet. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 553-554. Material to use and how to handle it.

Ship Construction. Oxy-Acetylene Welding in Hull Construction, Charles C. Phelps. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 727-729, 6 figs. Parts of vessel which may be welded with the approval of principal ship classification societies in United States and Great Britain.

The Use of Acetylene in Navy Yards, H. G. Knox. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 720-727, 25 figs. Oxy-acetylene apparatus for welding and cutting is said to have proved indispensable in building and repairing of ships. Uses are illustrated and typical plan of an oxygen, hydrogen and acetylene generating plant for navy yard is given. Paper read before Int. Acetylene Assn.

Tanks. Welded Water Tank Constructed from Surplus War Material. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 400-401, 4 figs. How iron sheets originally made for shrapnel protection in trenches are being used in construction of 9700-gal. water tanks.

Torch Carriage. A New Carriage for Welding Torches (Ein neues Fahrgestell für Schweissbrenner). Autogene Metallbearbeitung, vol. 13, no. 1, Jan. 1, 1920, pp. 7-9, 2 figs. Description and illustrations of a patented device consisting of a fork-like carriage with two wheels, whose connecting axle carries a socket for the attachment of the torch, by use of which it is possible, without any change of position between torch and surface of plate, to effect a more or less close approach to workpiece.

Training Welders. Training Welders and Cutters. Acetylene & Welding Jl., vol. 16, no. 193, Oct. 1919, pp. 102-103. Ability required by prospective welder.

Value of Oxy-Acetylene Welding Process, Alfred S. Kinsey. Metal Worker, Plumber and Steam Fitter, vol. 92, no. 19, Nov. 7, 1919, pp. 555-557. Points out training necessary to insure wider use and better services. Paper read before Internat. Acetylene Assn.

Tubes. Tube Welding by the Oxy-Acetylene Process, F. W. Smith. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 845-848, 6 figs. Writer believes that reasons for remarkably rapid growth of industry of tube welding are high quality and low cost of welded tubing.

[See also AUTOGENOUS WELDING; FUSION WELDING.]

OXYGEN

Determination of. The Determination of Oxygen by the Copper-Ammonia-Ammonium Chloride Reagent, W. L. Badger. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 161-164, 1 fig. Experimental work is reported to have demonstrated that solution of ammonia and ammonium carbonate recommended by Hempel and copied by Dennis is not satisfactory reagent for oxygen. Most convenient solution is made, it is stated, by saturating with ammonium chloride mixture of one part concentrated ammonia and one part water.

Electrolytic Production. The Electrolytic Production of Oxygen, C. J. Stanfield. Acetylene

& Welding Jl., vol. 16, no. 195, Dec. 1919, pp. 234-239. Description and details of several modern plants. Writer points out certain precautions which should be taken when electrolytic plant is installed. Cost data given on production of hydrogen and oxygen. Paper read before British Acetylene & Welding Assn.

See also HYDROGEN, Electrolytic Production.

Liquid. See EXPLOSIVES, Liquid Oxygen.

Pressure Measurement. Measurement of Oxygen or Acetylene Pressure. Use of Mercury Column. Acetylene & Welding Jl., vol. 16, no. 191, Aug. 1919, pp. 155 and 158, 2 figs. Suggested manner of employing ordinary compressed air manometer. Translated from Revue de la Soudure Autogène.

Solution by Water. See NITROGEN, Solution by Water.

Uses in Chemical and Metallurgical Industry. The Separation of Air into Oxygen and Nitrogen, Fred E. Norton. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 511-518, 4 figs. States that use of oxygen in chemical and metallurgical industry is retarded by inefficiency of existing systems for air separation. Jeffries-Norton system for air separation is described, which is an extension of Carnot theorem, but using adiabatic constant-pressure lines instead of adiabatic-isothermal cycle of Carnot.

Viscosity. See VISCOSITY, Gases.

OXYGEN CUTTING

Improvements in. Recent Developments in Oxygen Cutting, Stuart Plumby and F. J. Napolitan. Power House, vol. 13, no. 12, June 21, 1920, pp. 298-299; and Can. Machy., vol. 23, no. 26, June 24, 1920, pp. 590-591. Writers conclude that most interesting development which has occurred recently in connection with cutting is, without doubt, the successful cutting of cast iron. From ease with which wrought iron is cut, it is concluded that an aggregate of ferrite combines with oxygen with greatest avidity, and permits propagation of a cut with least interruption. Paper read before Am. Welding Soc.

OZONE

Electrical Production. Electrical Production of Ozone and Its Industrial Applications. Elec. Rec., vol. 26, no. 5, Nov. 1919, pp. 268-270, 9 figs. Description of equipment used in generation of ozone. Uses of ozone.

P

PACKING

Containers for. Home-Made Tests That Insure Safer Shipment, A. E. Snyder. Factory, vol. 25, no. 3, Aug. 1, 1920, pp. 358-360, 3 figs. Apparatus used for testing shipping containers at plant of Westinghouse Lamp Co. Practice of testing is said to diminish damage claims of company.

[See also BOXES; CRATING; EXPORT TRADE, Packing for.]

PACKING HOUSES

Refrigerating Plants. See REFRIGERATING PLANTS, Packing-House.

Waste Disposal. The Packingtown Waste Problem, Langdon Pearse. Jl. Western Soc. of Engrs., vol. 25, no. 11, July 20, 1920, pp. 365-373. Account of packing-house waste situation in sanitary district of Chicago. Waste amounts to about 75 tons of dry solids a day. Bearing of this load on sewage disposal of Chicago is explained.

PACKINGS

Steam and Hydraulic. Steam, Hydraulic and Miscellaneous Packings. Belting & Transmission, vol. 16, no. 12, June 20, 1920, pp. 19-21, 3 figs. Notes of materials used in construction, how they are applied to engines, pumps, valves, etc., and conditions affecting their operation.

PAINT OILS

Fume Loss in Boiling. Fume Loss in Boiling Oils, Henry A. Gardner and Harold Parks. Paint Manufacturers' Assn. of U. S., circular no. 95, May 1920, 3 pp. Tables showing experimentally determined fume loss of six oils when heated at varying temperatures for different periods of time.

Substitutes for. Paint Oil Substitutes, A. H. F. Phillips. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 663-664. Linseed oil substitutes being employed in manufacture of paints for railway use.

[See also OILS, China Wood; Tung.]

PAINTING

Spray Method. A Study of the Practicability of Spray Painting, Henry A. Gardner. Am. Architect, vol. 117, no. 2322, June 23, 1920, pp. 801-805, 8 figs. Tests made to determine practicability of spray painting showed it could be used in many instances where brush painting was unsatisfactory.

Comparative Tests of Applying Paint by Spraying Machines and by Hand. Eng. & Contracting, vol. 53, no. 8, Feb. 25, 1920, pp. 215-216. Results of tests made with a 4-hp. motor with a large air tank and a 5-gal. paint tank, operated with a 220-volt direct current. Abstracted from Paint, Oil & Drug Rev.

PAINTS

Exposure Tests. Report on Paint Exposure Tests at Atlantic City, New Jersey, Henry A. Gardner. Am. Architect, vol. 118, no. 2337, Oct. 6, 1920, pp. 445-449, 6 figs. Further account of paint exposure test panels consisting of wood and metal, both bare and coated with various types of paint and varnish, exposed on Young's Million Dollar Pier at Atlantic City, N. J., and described in Am. Architect issue of Aug. 27, 1919.

Heat Absorption of. Effect of Color of Paint on Heat Absorption, R. Z. Kirkpatrick. Eng. & Contracting, vol. 54, no. 12, Sept. 22, 1920, p. 293, 1 fig. Results of experiments made at Balboa Heights, Panama Canal Zone, to determine amount of heat absorption due to different colors of paints.

Iron Oxide. Recommended Specification for Iron-Oxide and Iron-Hydroxide Paints. Dept. of Commerce, Circular of Bur. of Standards, no. 93, 8 pp. Prepared and recommended by U. S. Interdepartmental Committee on paint specification standardization.

Ocher. Recommended Specification for Ocher, Dry and Paste. Dept. of Commerce, Bur. of Standards, no. 91, April 15, 1920, 8 pp. Prepared and recommended by U. S. Interdepartmental Committee on paint specification standardization.

Protective. An Investigation of the Protective Values of Structural Steel Paints, J. S. Coye.

Official Publication Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 49, May 7, 1919, 68 pp., 136 figs. Tests are said to have demonstrated that (1) gypsum and whiting are harmful when present to much greater extent than 5 per cent of pigment, (2) it is not safe to use carbon and graphite paints for first coat on steel, (3) coal-tar paints are worthless for structural steel exposed to atmosphere under ordinary conditions, (4) asphaltic-base paints should not be specified as general structural-steel coating, and (5) red lead, sublimed blue lead, sublimed lead sulphate and zinc and lead whites are very effective for first coats and produce good surfaces for repainting.

Red Lead. Recommended Specifications for Red Lead, Dry and Paste. Dept. of Commerce, Bur. of Standards, no. 90, April 3, 1920, 8 pp. Prepared and recommended by U. S. Interdepartmental Committee on paint specification standardization.

Rosin in. Use of Rosin in Paint and Varnish, Maximilian Toch. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 767-768. Experiments are quoted in which it is said that rosin with china wood oil paint left better surface for repainting than linseed oil paint. Paper read before Am. Inst. Chem. Engrs.

Specifications. Recommended Specifications for White Paint and Tinted Paints Made on a White Base Semi-Paste and Ready Mixed. Dept. of Commerce, Bur. of Standards, no. 89, March 10, 1920, 11 pp. Prepared and recommended by U. S. Interdepartmental Committee on paint specification standardization.

See also Ocher; Red Lead; Iron Oxide; White Lead; Zinc Oxide.

Thinners for. Notes on the Standardization of Mineral Spirits, Henry A. Gardner. Paint Manufacturers' Assn. of U. S., circular 94, May 1920, 3 pp. Rules are suggested for standardization of turpentine and other mineral oils used for thinning paints and varnishes.

White, Hiding Power of. Hiding Power of White Pigments and Paints, A. H. Pfund. Automotive Manufacturer, vol. 61, no. 10, Jan. 1920, pp. 31-32. How to determine true hiding power of a paint by means of cryptometer.

White Lead. Recommended Specification for Basic Sulphate White Lead, Dry and Paste. Dept. Commerce, Circular of Bur. of Standards, No. 85, Jan. 26, 1920, 11 pp. Prepared and recommended by U. S. Interdepartmental Committee on Paint Specification Standardization.

Zinc Oxide. Recommended Specifications for Zinc Oxide, Dry and Paste. Dept. Commerce, Circular of Bur. of Standards, No. 87, Feb. 16, 1920, 8 pp. Prepared and recommended by U. S. Interdepartmental Committee on Paint Specification Standardization.

Recommended Specifications for Leaded Zinc Oxide, Dry and Paste. Dept. Commerce, Circular of Bur. of Standards, No. 88, Feb. 16, 1920, 8 pp. Prepared and recommended by U. S. Interdepartmental Committee on Paint Specification Standardization.

[See also PAINT OILS; TURPENTINE.]

PALLADIUM

Ore. See COPPER MINES, Alaska.

PAPER

Composition. Graphic Analytical Method for Paper, Ignatius L. Gartland. Paper, vol. 25, no. 10, Nov. 12, 1919, pp. 15-19, 5 figs. Chart system of presenting analytical data concerning the composition of paper.

Deterioration. Durability, Preservation and Deterioration of Paper, Aribert and Bouvier. Paper, vol. 27, no. 4, Sept. 29, 1920, pp. 13-14 and 34. Account of experiments made to determine causes of deterioration of paper. Analysis of methods of manufacture of ancient papers to determine factors that produced durability.

Fiber Percentage. Estimating Percentages of Fibers in Papers, Roger C. Griffin. Paper, vol. 25, no. 9, Nov. 5, 1919, pp. 23-24. Count and estimation methods contrasted to advantage of latter.

Paper Yarn Industry. See YARN, Spinning and Dyeing.

Research. Research Problems of the Pulp and Paper Industry, D. C. Everest. Paper, vol. 26, no. 22, Aug. 4, 1920, pp. 11-14 and p. 30, 2 figs. Survey of work of Forest Products Laboratory.

The Future of Chemical and Engineering Research in the Pulp and Paper Industry, John Stevens, 3d. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 451-453, 3 figs. Prospectus on pulp and paper research. By-product possibilities and reduction of wastes. Less liquor dilution by more efficient washing. Fuel and power costs reduced by use of vacuum drying and better designed beaters.

Starch in. The Estimation of Starch in Paper, Oliver Kamm and Frank H. Tendick. Paper, vol. 25, no. 9, Nov. 5, 1919, pp. 20-21. Analysis for dextrins in presence of beater starch.

Testing. T. A. P. P. I. Report on Paper Testing, Frederick C. Clark. Paper, vol. 25, no. 18, Jan. 7, 1920, pp. 25-27. Recent advances in paper testing methods and new procedures are described.

Thread, Manufacture of. Manufacture of Paper Threads, J. G. Varlot. Paper, vol. 26, no. 26, Sept. 1, 1920, pp. 15-18 and p. 29, 5 figs. Machines developed in Europe, principally Germany. Translated from La Papeterie.

Manufacture of Paper Threads and Articles Made of Paper Thread (Fabrication des fils de papier et des produits en fil de papier), J. Dantzer. Technique Moderne, vol. 12, no. 5, May 1920, pp. 215-221, 21 figs. Machines employed for twisting thread.

PAPER MANUFACTURE

Bleach Consumption. Curtailing Bleach Consumption by Adding Sulphur to Digested Liquor, George K. Spence. Paper, vol. 26, no. 27, Sept. 8, 1920, pp. 19-21. Tables giving results of experiments performed with and without sulphur.

Cellulose Formations. Process for Cellulose Formations. Paper, vol. 25, no. 17, Dec. 31, 1919, pp. 23-24. German patent for producing cellulose formations by precipitating ammoniacal copper oxide cellulose solution.

Coloring. The Coloring of Paper, Otto Kress. Paper, vol. 25, no. 19, Jan. 14, 1920, pp. 17-20. Equipment required for testing dyes for strength and shade.

Eddy Mills, Hull, Canada. Developing and Organizing a Modern Pulp Products Mill. Paper, vol. 26, no. 16, June 23, 1920, pp. 17-19 and 34, 3 figs. Describes growth of great Eddy mills at Hull, Canada, with plants producing ground-wood and sulphite pulp, newsprint, cardboard, paper bags and other wood-pulp products.

Felts. Making and Using Felts, E. N. Huyck. Paper, vol. 26, no. 16, June 23, 1920, pp. 11-15 and 34, 10 figs. Account of difficulties the felt manufacturer must meet in keeping up with developments in machine design and high speeds, with suggestions for care of felts and jackets.

Grasses for. Possibilities of African Grasses in Paper Manufacture, Clarence J. West. Paper,

vol. 26, no. 16, June 23, 1920, pp. 10 and 28. Condensed analysis of many grasses grown in Africa, summarizing their possibilities in the manufacture of paper.

Machines. How Paper Is Formed on the Fourdrinier Wire. Paper, vol. 25, no. 11, Nov. 19, 1919, pp. 19-21, 2 figs. Influence of certain conditions as degree of upward or downward inclination of wire, height of damming behind slices, etc., on formation of sheet.

Mixing Tank vs. Beater. Automatic Continuous Mixing System for Paper Stock, Edward Trimbey. Paper, vol. 27, no. 3, Sept. 22, 1920, pp. 13-14, 1 fig. Comparison of beater system with mixing tank system; experiment conducted during past year in large newsprint mill claimed to show marked advantages for latter. Paper read before Technical Assn. of Pulp & Paper Ind.

Parchment Paper. New Process for Parchment Paper and Vulcanized Fibre. Paper, vol. 26, no. 20, July 21, 1920, pp. 17, 24. Use of sulfocyanates in making parchment and analogous substances found economical.

Pulp-Grinder Speed Control. Increasing Efficiency by Speed Control of Turbine-Driven Pulp Grinders, Adolph F. Meyer. Paper, vol. 26, no. 11, May 19, 1920, pp. 11-19, 14 figs. Method of controlling speed of hydraulic turbines is explained, and tachometer charts are given showing results secured with governor under average conditions.

Rags. Rags Used in Papermaking, Henry Atterbury. Paper, vol. 25, no. 15, Dec. 17, 1919, pp. 15-18. Their source, classification and assorting.

Research. See PAPER, Research.

Research Literature. Paper Research Literature. Paper, vol. 25, no. 23, Feb. 11, 1920, pp. 20-22. List of contributions by staff of French school of papermaking at Univ. of Grenoble.

Sizing. Colloid Sizing Process with Sodium Silicate. Paper, vol. 26, no. 16, June 23, 1920, p. 32. Description of a German invention dealing with sizing paper by means of mixtures of colloid substances with sodium silicate and precipitation of mixture by acid reagents.

Paper Sizing. Paper, vol. 26, no. 1, Mar. 10, 1920, pp. 11-12, 1 fig. Method for determining size fastness of paper is suggested which is based on determination of length of time required by a thio-cyanate of ammonium solution to penetrate paper, chloride of iron being used as indicator. Translated from Wochenblatt für Papierfabrikation.

Wood Fibers. History and Economics of Papermaking, Job Taylor. Paper, vol. 25, no. 4, Oct. 1, 1919, pp. 56 and 60-62. Early origin of the art and rise and development of wood fibers in papermaking.

[See also PAPER MILLS; WOOD PULP.]

PAPER MILLS

Electric Drive. Electric Drive in Paper Mills (De la commande électrique des machines à papier), M. Barbillion. Industrie Électrique, vol. 29, no. 677, Sept. 10, 1920, pp. 323-329, 2 figs. Advantages of electric drive in paper mills. Cost of installation.

Electric Drive of Paper Machines (Der elektrische Antrieb der Papiermaschine), Wilhelm Stiel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 2, 3 and 4, Jan. 10, 17 and 24, 1920, pp. 30-34, 64-68 and 87-92, 35 figs. Brief account of paper-manufacturing practices and the possibilities of mechanical and electrical development of paper machines. Details and illustrations of machines with rapid regulation, and notes on control switches and gear, switchboards, etc. Historical review of development of motor-driven paper machines.

Electric Power in the Manufacture of Sulphite Paper Pulp, R. L. Gregory. Elec. Rev. (Chicago), vol. 76, no. 2, Jan. 10, 1920, pp. 55-59, 6 figs. Features of electric motor drive and control as exemplified in interlake mills employing Mitscherlich process.

Electric, Steam and Water-Power Drive in a Paper Mill. Elec. Rev., vol. 76, no. 9, Feb. 28, 1920, pp. 345-347, 6 figs. Hydroelectric unit comprises 907-kva. three-phase alternator operating at 2300 volts, 60 cycles, and driven by 39-in. S. Morgan Smith water turbine having speed of 240 r.p.m. and equipped with Woodward governor.

The Electric Drive in Paper Mills, E. Tanner and C. F. Papworth. Elecn., vol. 84, no. 2184, March 26, 1920, pp. 344-348, 5 figs. Description of paper mill in south of England, having average weekly output of 1500 tons of paper.

Hazards in. Sulphate and Sulphite Hazards, Erling Riis. Paper, vol. 25, no. 8, Oct. 29, 1919, pp. 17-20. Particularly in yard of pulp mill where most accidents are said to occur.

Heating. New Heating System for Paper Mills. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 200-201, 2 figs. Steam piping and pumping arrangement for forced steam circulation and closed-loop boiler feeding.

Ocean Falls, B. C. Hydroelectric Plant and Paper Mill at Ocean Falls, B. C., W. A. Scott. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 35-38, 7 figs. Plant has producing capacity of 200 tons of paper per day. Special attention is given to features of motor drive.

100-Ton Mill. Large Pulp and Paper Mill Development by International Paper Co. at Three Rivers, Romeo Morrissette. Contract Rec., vol. 34, no. 15, Apr. 14, 1920, pp. 338-340, 3 figs. Description of 100-ton-per-day sulphite mill which is nearly completed. Outline of workmen's dwellings to be built in connection with plant.

Roofs. See ROOFS, Paper Mill, Decay Prevention.

PARACHUTES

American and German Types. Various Designs of Parachutes (Notes sur les parachutes d'avion), L. P. Frantzen. Aérophile, vol. 27, nos. 19-20, Oct. 1-15, 1919, pp. 309-312, 12 figs. American and German types.

Floyd Smith. The Floyd Smith Aerial Life Pack, Floyd Smith. Aviation, vol. 8, no. 2, Feb. 15, 1920, pp. 67-70, 8 figs. Instructions for packing and using aerial life pack.

Robert Type. Airplane Parachutes (Notes sur les parachutes d'avions), L. P. Frantzen. Aérophile, vol. 27, nos. 17 and 18, Sept. 1-15, 1919, pp. 279-283, 4 figs. "Robert" type, developed in France, which is said to open entirely in 3 4/5 sec.

Stability. Stability of the Parachute and Helicopter, H. Bateman. Nat. Advisory Committee for Aeronautics, report no. 80, 1920, 11 p. Mathematical theory.

Static Burns. Recent Data on Parachutes, Floyd Smith. Aviation, vol. 8, no. 9, June 1, 1920, pp. 369-370. Experimental study of friction static burns developed in silk parachutes.

Watkins Foulnot. The Watkins Foulnot Parachute, Wm. F. Watkins. Aviation, vol. 7, no. 10, Dec. 15, 1919, pp. 430-431, 12 figs. It is said to require only three-fourths of one second for quick reopening and to have rate of descent of 14 ft. per second. Specifications are: Diameter, 24½ ft.; shroud lines, 26 ft.; breaking strength, each line, 250 lb.; total strength of shroud lines, 6500 lb.

PARAFFIN

Analysis. See OIL, Analysis.

Effect of High Temperatures. The Effect of High Temperatures on Paraffin (Ueber die Einwirkung höherer Temperaturen auf Paraffin), Hugo Burstin and Wolfgang Jakubowicz. Rohölindustrie, vol. 10, no. 11, Nov. 1919, pp. 199-202. Results of experiments are said to demonstrate that by heating paraffin to 200 deg. cent. and upward, losses by decomposition take place which apparently affect equally all paraffin hydrocarbons, the losses depending upon height of temperature as well as on period of reaction. Report from "Galicia" Laboratory in Drohobycz.

Expansion Coefficient. Heat Expansion of Paraffin and Paraffin Solutions (Ueber Wärmeausdehnung von Paraffin und Paraffinlösungen), W. von Piotrowski. Zeitschrift für Physikalische Chemie, vol. 93, no. 5, Sept. 26, 1919, pp. 596-606. Results of experiments are said to show that the expansion coefficients of petroleum paraffin in solid state lie between 0.000842 and 0.005108 and average between 0.001114 and 0.003492; for lignite tar paraffin in liquid state they are twice as great.

Solidification Point. See NAPHTHALENE, Solidification Point.

Wax, Manufacture of. Paraffin Wax and Its Manufacture, A. Campbell and W. J. Wilson. Jl. Inst. Petroleum Technologists, vol. 5, no. 18, Feb. 1919, pp. 106-130 and (discussion) pp. 130-136, 1 fig. Experimental investigation (1) to observe effect of variation of time and rate of temperature-increase of sweating, and (2) to ascertain advantage or disadvantage of combining scales obtained by separate filtrations at different temperatures, as compared with separate sweating of crude products.

PARAVANES

See SUBMARINE MINES, Paravanes as Protection Against.

PARKS

Lighting. See LIGHTING, Parks.

PATENT LAWS

Needed Improvements. Needed Improvements in Our Patent Office and System, Glenn B. Harris. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 798-803. Comments on Patent Bill 11,984.

PATENTS

Rights of Patentee. Restraint of Trade in Patent Agreements, Chesla C. Sherlock. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 763-765. Exposition of rights and privileges conferred on patentee or owner of patent by statutes and by judicial influence of courts.

Securing. Patents and Inventions and How to Handle Them, B. M. Kent. Jl. Soc. Automotive Engrs., vol. 5, no. 4, Oct. 1919, pp. 307-310 and (discussion) pp. 310-313. Notes on commercially workable and invalid patents; how patents may be secured, etc. It is urged that the facilities of the Patent Office should be increased.

Valuation of Inventions. Patenting and Promoting Inventions, Mois H. Avram. Chem. Engr., vol. 28, no. 2, Feb. 1920, pp. 37-40. It is pointed out that value of an invention can be estimated only after careful survey of market it is designed to supply. It is held that such survey is as indispensable as investigation of technical character of invention.

PATTERNMAKING

Helical Gears. See GEARS, Helical, Patterns for.

Segmental Method. The Segmental Method in Patternmaking, James Edgar. Mech. World, vol. 66, no. 1713, Oct. 31, 1919, pp. 210-211, 7 figs. Believed to be preferable for shapes that are irregular or that have to be recessed in places after work is turned. Examples of application are given.

Shops. Pattern-Making Plant Notable for its Size, J. E. McDonald. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 834-836, 5 figs. Plant of Bryan Pattern & Machine Co., Bryan, Ohio. It is provided with modern equipment for turning out patterns of all kinds quickly.

The Pattern Shop at Balboa, R. D. Gatewood. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 723-725, 6 figs. Balboa shops of Panama Canal.

PATTERNS

Column. Making Column Patterns, Joseph Horner. Foundry Trade Jl., vol. 21, no. 215, Nov. 1919, pp. 795-800, 16 figs. Illustrating sequence of operations.

Construction of. Patterns as Foundry Tools, Jabez Nall. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 625-626, 4 figs. Writer tells how different metals affect design of pattern and points out factors of strength and contraction in pattern construction.

Gear. How Spur Gear Patterns are Made, Joseph Horner. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 687-691, 23 figs. Practical hints and advice on construction of patterns are included.

Handling. The Economical Control and Handling of Patterns in a Large Foundry, Walter D. Jones. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1043-1044. Describes pattern system adopted by large steel foundry, in which patterns go in turn from pattern storage to sketch and checking room, to active floor, and to foundry, and finally are returned to storage section. Movement of pattern through this cycle is governed by five cards, functions of which are explained in article. Paper read before Am. Foundrymen's Assn.

Storage. Safe Storage of Patterns, J. V. Hunter. Am. Mach., vol. 52, no. 17, April 22, 1920, pp. 901-902, 5 figs. Experience of Minneapolis Threshing Machine Co., which has built fireproof pattern-storage building to house what is estimated to be one million dollars worth of patterns.

Testing. Iron Foundry Assists Pattern Shop, H. E. Diller. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 887-891, 11 figs. Experience of foundry with gray-iron foundry established as adjunct to pattern department for testing and trying all patterns before delivery to customer.

PAVEMENTS

Asphalt. See PAVEMENTS, ASPHALT.

Asphaltic-Concrete. See PAVEMENTS, ASPHALTIC-CONCRETE.

Bitulithic. See PAVEMENTS, BITUMINOUS, Bitulithic.

Bituminous. See PAVEMENTS, BITUMINOUS.

Brick. See PAVEMENTS, BRICK.

Comparative Values of. Costs on Four Types of Pavement in Philadelphia Test Road. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 607-608. Twenty-six sections, comprising bituminous macadam, mixed and penetration methods, concrete and vitrified block compared.

Concrete. See PAVEMENTS, CONCRETE.

Costs. See Types.

Foundations for. Utilization of Old Concrete Pavements as Foundations, Arthur H. Blanchard. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 197-199, 6 figs. Experiences of various State Commissions.

Labor Requirements. Method of Estimating Labor Hour Requirements on Paving Work, D. B. Davis. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 508-509, 7 figs. Writer points out that in making an estimate of certain work a chart showing various conditions relating to work will help to guarantee against omission of important details. Brief study for determining labor-hour requirements for some divisions of work connected with a brick paving job in a city is included.

Map and File Record, Baltimore. Baltimore's Paving Recorded by Map and File System, R. Keith Compton. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 865-866, 2 figs. Special colored maps and supplementary card system are used.

Philadelphia. Street Paving in Philadelphia. Public Works, vol. 49, no. 10, Sept. 4, 1920, pp. 208-210, 2 figs. Nearly $8,000,000 of work being executed this year on 1800 miles of streets and roads, League Island Park and Roosevelt Boulevard. Concrete delivered by auto truck service from central mixing plant.

Replacement. Repaving—A Vital Problem for Municipalities, W. A. Bassett. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 534-536, 2 figs. Opinion held that almost all cities have failed to keep pace with needs. Specific examples show needs are four times annual mileage laid.

Resurfacing. Resurfacing Old Pavements. Public Works, vol. 48, no. 4, Feb. 7, 1920, pp. 55-59, 8 figs. Review of methods of resurfacing standard pavements.

Small Cities, Types for. Designing Street Pavements for Small Minnesota Cities, George M. Shepard. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 167-170. Practice is said to be for engineers to prepare specifications covering various types of development rather than to restrict bids to single type.

Stone. See PAVEMENTS, STONE.

Types. Economical City Pavements, A. P. Learned. Am. City, City Edition, vol. 22, no. 2, Feb. 1920, pp. 111-114, 1 fig. Makes comparison of different types and presents analysis of labor costs with particular reference to conditions in Southwest.

Wood-Block. See PAVEMENTS, WOOD-BLOCK.

PAVEMENTS, ASPHALT

Asphalt-Cement Specifications. Asphalt Cement Qualities and Tests Needed in Specifications for Sheet Asphalt and Asphalt Concrete Pavements, J. W. Howard. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 236-237. Qualities recommended to be specified include ductility, specific gravity, penetration and freedom from volatile oil.

Hot-Mix. Hot-Mix Asphalt Pavements, Francis P. Smith. Am. City, City Ed., vol. 21, no. 4, and 6, Oct. and Dec. 1919, pp. 341-347, 545-548, 6 figs. Standard sheet asphalt construction.

Joining to Car Tracks. Asphalt Paving Laid Without Granite Blocks Alongside Rails, Clifford A. Elliott. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 158-159, 4 figs. It is said that Pacific Elec. Ry. has omitted granite paving blocks from alongside girder and T-rails in paved-street construction.

Kentucky Rock Asphalt. Characteristics of Kentucky Rock Asphalt Pavements, Rodman Wiley. Mun. & County Eng., vol. 52, no. 6, Dec. 1919, pp. 266-268, 2 figs. Data in regard to durability and attention required in maintenance.

Maintenance Costs. Sheet Asphalt Maintenance Costs in District of Columbia, F. S. Besson. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 705-707. Use of salvaged material makes cost $1.74 square yard, including asphalt cost, haulage, cutting out, working patch.

New York City. Resurfacing Asphalt Pavements in New York. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 170-172, 2 figs. Describes how city forces removed about half an inch of worn and deteriorated wearing surface without injuring remainder and replaced it with new asphalt thoroughly welded. It is said that 183,000 yd. were resurfaced in 1919 at cost of less than $1 per yd.

Sheet Asphalt. Design of Bituminous Pavements of Fine Aggregate, R. Keith Compton. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 234-236, 2 figs. Where sheet-asphalt pavements are applicable.

New Design for an Asphalt Road, Hugh J. Fixmer. Public Works, vol. 48, no. 13, April 24, 1920, pp. 362-364, 5 figs. Design is proposed for using sheet asphalt with concrete shoulders on highways; also for constructing this in successive half-width sections.

Specifications for. Asphalt in Road Construction, Jules L. Goldberg. Public Roads, U. S. Dept. Agriculture, Bur. Public Roads, vol. 2, no. 18-19, Oct.-Nov. 1919, pp. 3-12, 4 figs. Bureau of Public Roads' specifications for different types of asphalt pavements.

Specifications for Asphalt Pavements. Good Roads, vol. 20, no. 14, Oct. 13, 1920, pp. 186-187. Prepared by technical committee of Asphalt Assn., New York, N. Y.

PAVEMENTS, ASPHALTIC-CONCRETE

Construction. Constructing Pavements by Halves, W. L. Hempelmann. Good Roads, vol. 18, no. 16, Oct. 15, 1919, pp. 179-180, 2 figs. Section of Texaco asphaltic concrete laid on Michigan Boulevard, Chicago, mentioned as example of efficiency of this type of construction.

Merits. The Merits of Asphaltic Concrete Pavements, W. H. Connell. Contract Rec., vol. 34, no. 25, June 23, 1920, pp. 603-605. Importance of properly maintaining asphaltic concrete roads in order to get maximum service from them is pointed out. As instance of successful maintenance, Grand Boulevard and concourse of New York City, built in 1910 and still in perfect condition, is indicated.

Types. Asphaltic Concrete Pavement, W. H. Connell. Can. Engr., vol. 38, no. 24, June 10, 1920, pp. 543-544, 559 and 561. Best asphaltic concrete pavement, writer has found in his experience as road builder, is a patented one which specifies 7½ per cent of asphalt, 8 to 10 per cent of limestone or Portland cement dust, 50 to 55 or 60 per cent of stone and 25 to 30 per cent of sand.

PAVEMENTS, BITUMINOUS

Aggregates. Mineral Aggregates for Bituminous Pavements, Wallace L. Caldwell. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 246-250. Classification of causes of failure of bituminous pavements and suggestions in regard to method of testing aggregates.

Bitulithic. Bituminous Pavement Investigations in Certain Texas Cities—Part I, Bitulithic, Roy M. Green. Bul. Agricultural and Mech. College of Texas, bul. 22, vol. 5, no. 9, May 1, 1919, 62 pp., 12 figs. It is concluded that seal coat of appreciable thickness is necessary in order to keep pavement in such a condition that it will be able to withstand action of traffic for long period of years.

Foundations for Warrenite-Bitulithic, George C. Warren. Good Roads, vol. 18, no. 26, Dec. 24, 1919, pp. 261-262 and 264, 2 figs. Discussion of relative merits of resilient and rigid basis for warrenite-bitulithic surfaces and of use of old macadam.

Construction Methods. Bituminous Paving Sug-

gestions, **Theodor S. Oxholm.** Public Works, vol. 48, no. 18, May 15, 1920, pp. 425-426, 1 fig. Corrugating base to prevent creeping of asphalt surface, use of old macadam as base, softness of asphalt that gives best results, and laying next to rails.

Mineral Aggregates for. Mineral Aggregates for Bituminous Pavements, Wallace L. Caldwell. Eng. & Contracting, vol. 53, no. 5, Feb. 4, 1920, pp. 126-128. Writer endeavors to differentiate causes and percentage of large number of failures of different types of bituminous pavements investigated by him. From paper read before Am. Soc. for Mun. Improvements.

Roller for Tamping Concrete Base. New Developments in Construction of Bituminous Concrete Pavements, Theodor S. Oxholm. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 150-151, 1 fig. Corrugated roller used for tamping screenings of concrete base of bituminous pavements in Borough of Richmond, City of New York.

Specifications. Bituminous Concrete and Brick Roads for Indiana. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 819-820. State specifications for brick paving and bituminous paving on concrete base.

[See also PAVEMENTS, ASPHALTIC; PAVEMENTS, ASPHALTIC-CONCRETE.]

PAVEMENTS, BRICK

Construction and Inspection. Construction and Inspection Methods Employed in Building the County Brick Pavement Connecting Waterloo and Cedar Falls, Iowa, E. A. Zack and C. M. Fisher. Municipal & County Engr., vol. 58, no. 5, May 1920, pp. 195-196. Pavement is 18 ft. wide with uniform thickness of 8½ in., 2-in. crown and equally crowned subgrade, and base 5 in. thick of concr. 1 to 3 to 5. Notes on construction methods and equipment, procedure in cold weather, etc. Paper before Iowa Eng. Soc.

Design. The Design and Construction of Different Types of Pavements, M. B. Greenough. Good Roads, vol. 19, no. 20, May 19, 1920, pp. 251-254. Discussion on brick construction. It is pointed out that tendency of design is away from slab types of brick pavement and toward types that depend upon quality of individual unit as against monolithic surface. Paper presented before Am. Road Builders' Assn.

Economical Construction. Suggested Economies in Brick Street and Road Construction, Will P. Blair. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 262-264. In designing of proper tools and appliances which will lessen actual labor necessary in construction.

Fillers for. Asphalt Fillers for Brick and Stone Pavements. Contract Rec., vol. 34, no. 21, May 26, 1920, pp. 477-479. Deals with methods of application and specifications for material, and joint filling in monolithic construction.

Recent Experience in the Development of Brick Pavement Construction in the City of Chicago, H. J. Fixmer. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 147-149, 1 fig. Service records of pavements with different kinds of fillers are presented. It is stated that as result of experience during recent years Board of Local Improvements has adopted asphalt filler as standard filler for brick pavements in streets and alleys.

Success of Asphalt Joint-Filler in Vertical-Fiber Brick Pavements, Clark R. Mandigo. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 211-212. As dependent on (1) method of application, (2) shape and texture of brick, (3) quality of filler, and (4) character of traffic.

Methods and Costs. Methods and Cost of Constructing 12 Miles of Monolithic Brick Pavement, F. A. Churchill. Eng. & Contracting, vol. 53, no. 2, June 2, 1920, pp. 629-630, 4 figs. Details of construction of pavement in Ohio between Ashtabula and Conneaut at cost of $421,000 plus $63,000 for a 2-ft. concrete gutter on one side, job requiring about 4,500,000 brick. Contractor estimated that he saved 15 cents per sq. yd. by using Parrish automatic templets and monolithic construction instead of cement-sand construction and manual labor on foundation.

Monolithic. Monolithic Brick Pavement Fails from Expansion, M. W. Watson. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 595-596, 3 figs. Experience in Kansas highways. Heat caused brick slabs to separate from concrete base and finally to rupture with violence.

Specifications. Proposed Amendments to Standard Specifications for Brick Paving. Better Roads and Streets, vol. 9, no. 12, Dec. 1919, pp. 409-410. Submitted to Standard Specification Committee of Am. Soc. for Mun. Improvements by Nat. Paving Brick Mfrs. Assn.

Vertical-Fiber. Vertical Fiber Brick Pavement. Mun. Jl. and Public Works, vol. 47, no. 18, Nov. 1, 1919, pp. 266-267. Advantages of this type of pavement and account of its latest developments.

Vertical Fiber Vitrified Brick Paving, Clark E. Mandigo. Clay Worker, vol. 73, no. 7, June 1920, pp. 700-705, 7 figs. Advantages of this type of street surfacing are (1) road may be opened for traffic as soon as filler has been applied, (2) service cuts and openings are easily and simply repaired, (3) it carries minimum risk in construction since serious defects do not result through careless workmanship, etc., (4) steps in construction are simple, (5) filler is easily manipulated and not subject to damage by frost, rain or premature traffic, (6) noise is eliminated, (7) it provides ideal, nonskid, smooth-riding surface for automobiles, etc. Paper read before Am. Soc. for Municipal Improvements.

PAVEMENTS, CONCRETE

Alleys. Labor Cost of Paving Alleys with Concrete. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, p. 638. Data obtained in paving four alleys at University City, Mo., in 1917 and 1919.

Cold-Weather Construction. Precautions for Concrete Pavement Construction in Cold Weather. Concrete Age, vol. 1, no. 3, Dec. 1919, pp. 16-17. Arrangement which is said to have enabled placing of concrete at from 75 to 85 deg. during temperatures from 4 to 43 deg.

Construction. Cement Concrete Pavements in New Zealand and the United States and Canada, Walter E. Bush. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 735-737. Practices of construction and records of service. Paper read before County Councils Assn. at Roads and Transport Congress.

Concrete Pavements and Walks, Tyrrell B. Shnertzer. Nat. Lime Assn., no. 3, 7 pp., 1 fig. Directions for putting in sub-base and for proportioning and mixing concrete base and top course.

Cost. Charts Tell Cost of Concrete Paving, F. J. Herlihy. Eng. News-Record, vol. 84, no. 6, Feb. 5, 1920, pp. 261-264, 5 figs. Curves are given for determining bidding prices under wide range of physical conditions and variations in wages of labor and prices of equipment.

Design. Fundamental Considerations for Concrete Pavement Design, S. T. Morse. Eng. & Contracting, vol. 53, no. 9, Mar. 3, 1920, pp. 245-247. Writer describes effect of roadway

width on thickness of pavement and gives formula for design of concrete slabs. Reference is made to Prof. Duff A. Abrams' tests at Lewis Inst., Chicago.

Handling Concrete Material. New Method of Handling Concrete Material on Minneapolis Paving Job, Ellis R. Dutton. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 22-24, 3 figs. Truck tractor having dumping body used in connection with bucket loader.

Maintenance. Maintenance Methods for Concrete Pavements. Eng. & Contracting, vol. 54, no. 9, Sept. 1, 1920, pp. 211-213, 4 figs. Methods of filling cracks and joints with tar and asphalt, repairing of spots where concrete has worn, replacing concrete in pavement cuts and repairing joints which were improperly installed. From bulletin issued by Portland Cement Assn.

Railway-Station. Permanent Pavements at Railway Stations and Freight Terminals, H. Colin Campbell. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 19-20, 6 figs. Their construction suggested as inviting field for contractors specializing in concrete street and highway paving.

Slag as Aggregate for. Slag as Coarse Aggregate for Concrete Pavements. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 525-526. Results of various tests of slag at the Structural Materials Research Laboratory, Lewis Inst., Chicago, and summarized by C. Gray and F. Kallam in February issue of Concrete Highway Mag.

Voids in Aggregate. Does It Pay to Determine Void Percentages in Coarse Aggregate for Concrete Pavement? William G. Crandall. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 264-266, 2 figs. Diagrams for obtaining interpolated values of factors when voids in either of coarse aggregates vary from multiple of 5 per cent.

[See also FOUNDATIONS, Concrete Pavements as; ROADS, CONCRETE, Design and Construction.]

PAVEMENTS, GRANITE-BLOCK

See PAVEMENTS, STONE.

PAVEMENTS, STONE

Granite-Block. Granite Block Construction, Jules L. Goldberg. Public Roads, U. S. Dept. Agriculture, Bur. Public Roads, vol. 2, nos. 16-17, Aug.-Sept. 1919, pp. 3-11, 7 figs. Detailed account of methods of construction, and methods of testing.

Granite Block on Old Concrete Base. Public Works, vol. 48, no. 19, May 22, 1920, pp. 441-442, 1 fig. Repaving part of Park Avenue, New York, for heavy traffic, with granite blocks replacing asphalt blocks on original base.

Method of Constructing Duras Pavement, W. C. Mallonee. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 351-352, 2 figs. Granite block pavements laid upon concrete foundation.

Repaving Granite Block Streets in New York. Public Works, vol. 48, no. 11, Mar. 27, 1920, pp. 231-233, 4 figs. Account of how a large area of worn granite blocks was replaced by new blocks on new concrete base in Borough of Manhattan during 1919. It is related that old blocks were not recut and although only very slight grading was required, cost was about 59 per cent greater than for similar work done in 1916.

PAVEMENTS, WOOD-BLOCK

Comparative Value of Woods. Utility of Hardwoods for Paving Shown in Comparative Tests, E. E. Butterfield. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 656-658. Relative insusceptibility to expansion through water absorption, and greater strength are said to recommend oaks and hickory.

Contraction of. Wood Block Pavement Fails Through Contraction and Flotation, W. W. Horner. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 814-817, 1 fig. It is reported that section of pavement in street in St. Louis, Mo., was destroyed and another section suffered damage because of contraction of blocks and their flotation due to melted pitch.

Creosote Oil for Blocks. Proper Grade of Creosote Oil for Wood Paving Blocks, K. M. Waddell. Mun. & County Eng., vol. 52, no. 6, Dec. 1919, pp. 269-272, 3 figs. Characteristics required are said to be, (1) toxicity, (2) waterproofing values, (3) permanence, and (4) penetrance.

Economical Value. Wood Block Paving, Walter Buehler. Jl. West. Soc. of Engrs., vol. 25, no. 3, Feb. 5, 1920, pp. 73-84 and (discussion) pp. 84-92, 6 figs. Inspection of creosoted-block pavements in loop district of Chicago is said to demonstrate that these pavements have been an economic investment.

Joint Spacer. New Joint Spacer for Wood-Block Pavements, John Stanley Crandell. Good Roads, vol. 18, no. 22, Nov. 26, 1919, p. 227, 2 figs. Corrugated cardboard spacer placed between each two rows.

See also ROADS.

Street Railway Tracks. Wood Block Paving Between Street Railway Tracks, Andrew F. Macallum. Am. City (City Edition), vol. 22, no. 3, March 1920, pp. 237-238, 2 figs. Method of tract construction employed on Elgin Street, Ottawa, in 1919. Wood blocks are laid on pitch cushions and sandstone blocks on mortar cushions.

Tightening Blocks. Jackscrews Tighten Wood Block Pavement in Place, W. W. Horner. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 686-689, 3 figs. Method developed at St. Louis, Mo. Pavement is cut in two at intervals and blocks on each side of cuts tightened up with jack-screws.

PAVING BRICK

Specifications. New Paving Standards. Brick and Clay Rec., vol. 55, no. 12, Dec. 2, 1919, pp. 1041-1042. Recently revised specifications for standard vitrified paving brick of Nat. Paving Brick Manufacturing Assn.

Paving Brick Manufacturers Seek Specification Changes. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, p. 854. Lugless brick, standard sand cushion for bituminous fillers and 4-in. base, are among features proposed.

PEAT

Boiler Fuel. See BOILER FIRING, Peat Fuel.

Classification. Quality and Value of Important Types of Peat Material, Alfred P. Dachnowski. U. S. Department of Agriculture, bul. no. 802, Dec. 29, 1919, 40 pp. Also in Jl. Am. Peat Soc., vol. 13, no. 2, April 1920, pp. 219-261. A classification of peat based upon its botanical composition and physical and chemical characteristics.

Deposits, Ireland. The Peat Resources of Ireland, Pierce F. Purcell. Dept. Sci. & Indus. Research, special report 2, 1920, 25 pp., 3 figs. Notes on utilization of peat are included.

Fertilizers. See FERTILIZERS, Peat for.

Gasification. Power and Heat Economy in Railroad Operation (Kraft- und Wärmewirtschaft im Eisenbahnwesen), H. Landsberg. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 28, July 10, 1920, pp. 517-522, 1 fig.

Details of the gasification of humid bituminous fuels, especially of lignite and peat and its importance in connection with electric traction. Considerations of heat economy suggest a combined oil-engine and electric power plant for the consummation of which problems, such as recovery of by-products, gas turbines, etc., must be solved.

Minnesota, Utilization of. Logical Methods of Utilization of Minnesota Peat, Henry H. Hindshaw. Jl. Am. Peat Soc., vol. 13, no. 1, Jan. 1920, pp. 37-44. Opinion is expressed that best method of utilizing Minnesota peat is by means of standard by-product oven. This treatment of peat, it is pointed out, would admit of smelting of iron ores on Messabi Range.

Pulverized. Pulverized Peat Firing in Sweden (Die Torfstaubfeuerung in Schweden), P. Wangemann. Feuerungstechnik, vol. 8, no. 7, Jan. 1, 1920, pp. 53-58, 16 figs. It is pointed out that in America the difficulty of pulverized coal firing was overcome by increased drying and finer grinding, whereas in Sweden the opposite method was employed of adapting burner to coarser material with greater water content, both methods proving successful. Advantages and disadvantages of both methods are discussed. Results of experiments are said to show that pulverized peat firing results in higher superheat temperature than anthracite firing.

PELORIS

See DIRECTION FINDERS, Fessenden Peloris.

PELTON WHEELS

See HYDRAULIC TURBINES, Pelton Type.

PENDULUM

Period of Oscillation. Influence of Deformations of Knife and Supporting Plane on Period of Oscillation of Pendulum (De l'influence de la déformation du couteau et du plan de suspension sur la durée des oscillations du pendule), Paul Le Rolland. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 455-457. It is explained why short oscillations are more noticeably affected by deformations.

PERMUTIT

Basic Exchange. The Basic Exchange in Permutit—II (Der Basenaustausch im Permutit), V. Rothmund and G. Kornfeld. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 3, Oct. 1, 1919, pp. 215-225, 3 figs. Continuation of experiments which are said to show that with the series silver-barium and sodium calcium a formula for the exchange between monovalent and bivalent ions was tested and confirmed; and in the case of silver-lanthanum it is shown that trivalent ions are also adaptable to exchange, when the effect of dilution is very great. From the Physical-Chem. Inst. of the German University, Prague.

PETROLEUM

Bibliography. Recent Articles on Petroleum and Allied Substances, E. H. Burroughs. Dept. Interior, Bur. Mines, Monthly Reports of Investigations, Nov. 1919, 19 pp. In current technical literature and in U. S. patent specifications.

Recent Articles on Petroleum and Allied Substances. Monthly Reports of Investigations, Bur. of Mines, Feb. 1920, 33 pp. Covering history, geology and origin, development and production, transportation, storage and distribution, properties and their determination, refining, and utilization.

Colombian Law. The Colombian Petroleum Law, J. W. Thompson. Eng. & Min. Jl., vol. 109, no. 21, May 22, 1920, pp. 1170-1172. Regulations concerning development and providing royalties to be paid. Foreign companies required to have local representatives. Development or production tax of 8-6-4 per cent, determined by distance from sea coast.

Consumption in U. S. The Industrial Demand for Oil and the Available Supply, George Otis Smith. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1419-1421. Warning is issued that rate of consumption of oil in United States exceeds rate of production. Total consumption for year at present rate would be 490,000,000 bbl., while production is expected to be 415,000,000 bbl.

Cracking. The Jenkins Cracking Process. Oil News, vol. 8, no. 1, Dec. 5, 1919, pp. 11-16, 2 figs. Letters Patent specifications of Jenkins process for treating petroleum products for gasoline and other condensable light by-products.

Distillation. Continuous Process and Apparatus for the Complete Destructive Distillation of Petroleum Hydrocarbons and Coal Tar (Kontinuierliches Verfahren und Apparatur zur vollständigen destruktiven Destillation von Erdölkohlenwasserstoffen und Kohlenteer). Petroleum, vol. 16, no. 5, June 10, 1920, pp. 145-147, 3 figs. Describes patented process by which residual is injected continuously or periodically into a vertical or inclined muffle of fire clay or other refractory material.

Removal of the Lighter Hydrocarbons from Petroleum by Continuous Distillation, with Especial Reference to Plants in California, J. M. Wadsworth. Bur. of Mines, bul. 162, petroleum tech. 45, 1919, 152 pp., 50 figs.

See also CATALYSIS, Petroleum Derivatives.

Fractionation. Constant-Temperature Still Head for Light-Oil Fractionation, Frederick M. Washburn. Dept. Commerce, Technologic Papers, Bur. Standards, no. 140, Oct. 18, 1919, 12 pp., 4 figs. Also in Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 73-77, 4 figs. Types of methods generally in use for fractionation of light oil and determination of benzene, toluene and solvent naphtha are discussed and improvement is suggested of dephlegmator of Wilson and Roberts still.

Geology. Contribution of Oil Geology to Success in Drilling, F. G. Clapp. Min. & Metallurgy, no. 165, Sept. 1920, p. 23. Describes duties of oil geologists and petroleum engineers. (Abstract.)

Geologic Distillation of Petroleum, Bailey Willis. Min. & Metallurgy, no. 157, section 10, Jan. 1920, 7 pp., 1 fig. Peckham's hypothesis is applied to and found to be confirmed in Appalachian field.

Great Britain. British and Colonial Petroleum Resources, Henry B. Milner. Can. Min. Jl., vol. 41, no. 35, Sept. 3, 1920, pp. 716-721, 1 fig. Review of oil situation.

Huntley Field, Montana. Geology and Oil and Gas Prospects of the Huntley Field, Montana, E. T. Hancock. Dept. Interior, U. S. Geol. Survey, Bul. 711-G, Feb. 28, 1920, pp. 105-148, 7 figs. Study of stratigraphy and structure, noting specially features which have been elsewhere found to bear definite relation to accumulations of oil and gas.

Industry. International Aspects of Petroleum Industry, Van H. Manning. Min. & Metallurgy, no. 158, section 24, Feb. 1920, 10 pp. Attention is called to strong nationalistic tendency of foreign countries to exclude other nationals from developing oil fields, and to rapidly diminishing petroleum supply in United States.

Methods for More Efficiently Utilizing our Fuel Resources, Chester G. Gilbert and Joseph

E. Pogue. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 198-207, 5 figs. Treats of nature and occurrence of petroleum and essential features of petroleum industry, including production, transportation and refining, as well as distribution of products. Chart is included showing relative values of principal petroleum products in United States from 1899 to 1914.

The Petroleum Industry in the Years 1916-1918 (Die Erdölindustrie in den Jahren 1916-1918), Richard Kissling. Chemiker-Zeitung, vol. 43, nos. 153, 154 and 155, Dec. 20, 23 and 25, 1919, pp. 897-899, 905-909, and 913-917. A review of production and of literature, patents, processes, etc., from all parts of the world.

Japan, Production in 1918. New Activity in Japan's Oil Industry, K. Ito. Oil & Gas Jl., vol. 18, no. 40, Mar. 5, 1920, pp. 64-66, 2 figs. Figures for 1918 production. Article from The Trans-Pacific, published in English, at Tokyo, Japan.

Mapping. The Barometric Method of Geologic Surveying for Petroleum Mapping, Frederic H. Lahee. Economic Geology, vol. 15, no. 2, Mar. 1920, pp. 150-169, 8 figs. Comparison is included of barometric and plane table methods.

Montana. Geology and Oil and Gas Prospects of the Huntley Field, Montana, E. T. Hancock. Dept. of Interior, U. S. Geol. Survey, bul. 711-G, Feb. 28, 1920, pp. 105-148, 9 figs., 2 on supp. plates. Account of topography, geology and structure of Huntley Field. Possibility of oil and gas is said to lie in proximity to productive fields, similarity of stratigraphy to that of neighboring productive fields, surface indications of oil and gas, and existence of favorable structure.

Ontario. Future Prospects for Oil and Gas Production in Ontario, M. U. Williams. Can. Chem. Jl., vol. 4, no. 7, Sept. 1920, pp. 246-248. Extent to which various geological formations have been searched for oil and results obtained. Paper read before Can. Min. Inst.

Papua. Note on a Papuan Natural Petroleum, J. Read and A. C. P. Andrews. Jl. Soc. Chem. Industry, vol. 39, no. 16, Aug. 31, 1920, pp. 289T-291T. It contains about 11 per cent of aromatic hydrocarbons, from which fraction having combined content of benzene and toluene amounting to about 10 per cent can be obtained.

Peru and Bolivia. The Prospects for Petroleum Production in Peru and Bolivia, Charles S. Haley. Eng. & Min. Jl., vol. 110, no. 16, Oct. 16, 1920, pp. 772-774. High cost of development, difficulties of transportation, high royalties asked and objection to long-term concessions are drawbacks to exploitation of oil possibilities in these countries.

Recovery from Shale. The Recovery of Mineral Oil Substitutes from Bituminous Shales (Mineralöl-Ersatz aus bituminösen Schiefern), Max v. Isser. Rohölindustrie, vol. 10, no. 11, Nov. 1919, pp. 197-199, 2 figs. Account of bituminous shale formations in the Tirolean mountains containing from 8 to 20 per cent bitumen, and description of processes for recovery of mineral oil from them.

Rectified Petroleum Spirit. Composition of Rectified Petroleum Spirit from Toluol-Petroleum Spirit Runnings of Asiatic Petroleum, H. G. Evans. Jl. Soc. Chem. Indus., vol. 38, no. 23, Dec. 15, 1919, pp. 401T-402T, 1 fig. Account of investigation undertaken to determine approximate composition of petroleum spirit in toluol-petroleum spirit runnings from Asiatic petroleum.

Refinery Sludge, Utilization of. Utilization of Asphaltic Base Acid Sludge Obtained in Refining Petroleum and Shale Oils, Charles Baskervile. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 30-31. Method developed at Dept. of Chem., College of City of N. Y.

Refining. Spent Lyes and Waste Waters in Petroleum Refining (Die Abfallaugen und Abfallwässer der Erdöverarbeitung), Fred. Schulz. Petroleum, vol. 14, nos. 14 and 15, Apr. 15 and May 1, 1919, pp. 644-658 and 711-718, 1 fig. It is pointed out that the spent lye escaping along with the viscous emulsions and wash water when alkaline purification of the petroleum distillates takes place, contains, besides the inorganic salts, soda soaps of the carbo-xylic acids which are insoluble in water and sulphonic acids in addition to neutral hydrocarbons. The removal of organic matter, it is said, can be successfully accomplished only with cooking salt. Report from Inst. for Indus. Advancement of Chamber of Commerce & Industry at Prague.

The Regeneration of Waste Acids in Mineral Oil Refineries (Die Regenerierung von Abfallsäuren der Mineralölraffinerien), E. A. Kolbe. Petroleum, vol. 14, no. 17, June 1, 1919, pp. 837-847, 5 figs. Results of experiments are said to show that by simply heating it is possible to recover almost 90 per cent of the sulphuric acid contained in the waste acids of the refining process, mainly in form of sulphur dioxide. Description and illustration of the Rossi revolving head used in tests for spraying the waste acids.

Residuals. Characteristics of Steam-Distilled Petroleum Residuals, B. A. Anderton. Can. Engr., vol. 39, no. 15, Oct. 7, 1920, pp. 411-414, 11 figs. Tests of consistency with progress of distillation. Paper presented before Am. Soc. for Testing Matls.

Resources of U. S. Industry's Need of Oil, George Otis Smith. Iron Age, vol. 105, no 23, June 3, 1920, pp. 1584-1586. Warning is issued that oil demand in United States is now in excess of supply. First three months of 1920, it is said, have established rate of domestic production that if unchecked will mean 415,000,000 bbl. for year, and rate of consumption that will make year's requirements more than 490,000,000 bbl. Paper read before Am. Iron and Steel Inst.

Scotland. Oil Possibilities in Scotland, H. M. Cadell. Tran. Min. Inst. Scotland, vol. 41, no. 3, Oct. 18, 1919, pp. 34-50 and (discussion) pp. 50-60. Geology of Scotland is compared with geology of oil-bearing regions of the world.

Shale Oil. See OIL SHALES, Johns Extraction Process.

Storage. Dangers of the Oil Room, S. D. Rickard. Power Plant Engr., vol. 23, no. 24, Dec. 15, 1919, pp. 1123-1124. Explosive and burning qualities of various liquids; accounting for oil used; storage systems.

Fireproof Terminal Oil House, Albert P. Sharp. Ry. Mech. Engr., vol. 93, no. 10, Oct. 1919, pp. 579-580, 7 figs. Oil is received from cars, floors of which are on level with receiving and shipping platform and is transferred from barrels to tanks in basement by gravity through filling pipes.

Sulphur in. A Rapid Method for the Determination of Sulfur in Petroleum Oils, A. W. Christie and C. S. Bisson. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 171-172. Volumetric method for determination of sulphur in petroleum oils by separating it, after combustion of oil in a bomb, as insoluble benzidine sulphate and determining it by titration with standard potassium permanganate.

Tests for. See also OILS, Mineral, Tests for.

U. S. Reserves. The Petroleum Reserves of the United States. Petroleum Times, vol. 3, no. 59, Feb. 21, 1920, p. 190. It is said that

Dr. David White, chief geologist of U. S. Geol. Survey, forecasts exhaustion in twenty years, total available supply being approximately 7,000,000,000 bbl.

U. S. Supply. A Foreign Oil Supply for the United States, George Otis Smith. Min. & Metallurgy, no. 157, section 4, Jan. 1920, 5 pp. Geologists estimate available reserves of oil in U. S. at a figure which does not permit continuance for a long time of present rate of consumption. It is urged that Government give moral support to Americans in developing oil fields of Mexico, South America, Mesopotamia and Africa.

War Problems. Some War Problems of Petroleum Supply. Jl. Instn. Petroleum Technologists, vol. 5, no. 20, June 1919, pp. 251-285. Emphasizes important uses of oil during war and visualizes future development of petroleum industry in view of what is termed accepted theory that supply of oil in world is being rapidly exhausted.

Water in, Determination. Bureau of Mines Method for Determining Water in Petroleum, E. W. Dean and W. A. Jacobs. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2159, Sept. 1920, 3 pp. New method employs specially constructed distilling tube receivers.

World Resources. Political and Commercial Geology Series. The Petroleum Resources of the World, John D. Northrop. Eng. & Min. Jl., vol. 109, no. 1, Jan. 3, 1920, pp. 34-38, 1 fig. It states that American, British, and Dutch interests control most of world's oil; also that U. S. is supreme in western hemisphere but has not aggressive nationalistic policy of foreign governments.

[See also MINERAL OILS; OIL FIELDS; OIL SHALES; OIL WELLS; PARAFFIN.]

PETROLEUM INDUSTRY

Baku. The Petroleum Industry of Baku (L'Industria petrolifera di "Baku"), Rivista Marittima, vol. 52, nos. 8 and 9, Aug. and Sept. 1919, pp. 201-228, 2 figs. General statistics of production of region compared with figures indicating total production in Russia.

Bureau of Mines. Relations of the Bureau of Mines to the Oil Industry, F. G. Cottrell. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2166, Sept. 1920, 6 pp. Address delivered at Convention of Independent Oil Men's Assn. at Denver, Colorado, Thursday, Sept. 30.

Conditions in 1920. The Trend of the Oil Industry during First Half of 1920, Joseph E. Pogue. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 451-456, 4 figs. Review as to stocks, exports and production compared with conditions in 1919.

Problems of. The Problems of the Petroleum Industry, William A. Hamor. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 425-434, 5 figs. Pyrolysis of fuel oils into gasoline. Substitutes for petroleum products. Chemical synthetic products from petroleum.

PETROMETER

See AUTOMOBILE ENGINES, Fuel-Consumption Measurement.

PHASE LAW

Gibbs Triangle. Graphic Presentation of Systems of the Form $a + b = c$ in Triangular Coordinates and an Illustration of the Phase Law (Ueber die Graphische Darstellung von Systemen der Form $a + b = c$ in Dreieckskoordinaten und eine Veranschaulichung der Phasenregel), Wa. Ostwald. Zeitschrift für Elektrochemie, vol. 25, no. 15-16, Aug. 1, 1919, pp. 251-255, 5 figs. The Gibbs triangle is defined and illustrated; writer finds that Gibbs coordinates are practicable in positive, but not in negative values.

PHASE MODIFIERS

Commutator Type. Commutator Phase Shifters (Ueber Kommutator-Phasenschieber), J. Kozisek. Elektrotechnische Zeitschrift, vol. 41, no. 3, Jan. 15, 1920, pp. 52-55, 15 figs. Notes on effect of saturation and extension of compensating field. Other means of extension, such as three-phase regulation of phase shifters, excess compensation at full load, etc., are discussed.

Kapp's Vibrator. Kapp's Vibrator and Its Application (Der Kappsche Vibrator und seine Anwendungen), Kurt Perlewitz. Elektrotechnische Zeitschrift, vol. 40, no. 34, Aug. 21, 1919, pp. 405-407, 9 figs. Graphic presentation of operating results obtained with vibrators coupled with large three-phase motors.

PHOSPHATES

Australian Deposits. Utilization of Phosphate Deposits of Australia, John W. Paterson. Commonwealth of Australia, Advisory Council of Sci. & Industry, reprinted from bul. 7 of Advisory Council, 12 pp., 5 figs. Possibility of utilizing Australian phosphate deposits.

PHOSPHOR BRONZE

See BRONZES, Phosphor Bronze.

PHOSPHORUS

Determination in Iron, Steel, Ores and Slag. Critical Investigation of Methods of Determining Phosphorus Content in Iron, Steel, Ores and Slag (Kritische Untersuchung der Verfahren zur Bestimmung des Phosphors in Eisen, Stahl, Erzen und Schlacken). Stahl u. Eisen, vol. 40, nos. 12 and 14, Mar. 18-25 and Apr. 8, 1920, pp. 381-387 and 468-472 and (discussion) pp. 472-473. Account of experiments carried out by sub-committee of chemical committee of the Assn. of German Foundrymen, results of which are shown in tabular form.

Red, Use as Reducing Agent. Red Phosphorus as a Reducing Agent, Ludwig Rosenstein. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 883-889. Reactions between red phosphorus and acid solutions of various salts are studied and their application to qualitative analysis indicated.

PHOTOELECTRICITY

Sensitivity of Silver Sulphide. Spectral Photoelectric Sensitivity of Silver Sulphide and Several Other Substances, W. W. Coblentz and H. Kahler. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 344, Sept. 19, 1919, pp. 231-249, 17 figs. Data on change in electrical resistance of sulphides of silver and of bismuth, when exposed to radiations of wave lengths extending from 0.6 μ invisible spectrum to about 3 μ in infra-red; also measurements upon galena cylindrite, pyrites, and jamesonite.

Thalofide Cell. "Thalofide Cell"—A New Photo-Electric Substance, T. W. Case. Physical Rev., vol. 15, no. 4, sec. series, Apr. 1920, pp. 289-292, 3 figs. Describes a photoelectric cell composed of thallium, oxygen and sulphur, which shows maximum sensitiveness to light of wave length about 10,000 Angstrom units. Some of best cells lower their dark resistance by 50 per cent. Dark resistance of different cells may be from 5 to 500 megohms. Mentions chief characteristics of cells.

PHOTOGRAPHY

Aerial. See AERIAL PHOTOGRAPHY.

Color. The Prospects for Color Photography (Die

Aussichten der Farbenphotographie), Felix Formstecher. Deutsche Optische Wochenschrift, no. 15-16 and 19-20, Apr. 15 and May 11, 1920, pp. 131-132 and 162-165. Deals with color photographs in which the color values are positively established by the process of production, from the so-called photographs in natural colors.

Motion-Picture. See MOTION-PICTURE PHOTOGRAPHY.

Panchromatic Plates. Hypersensitizing Commercial Panchromatic Plates, Samuel M. Burka. Jl. Franklin Inst., vol. 189, no. 1, Jan. 1920, pp. 25-46, 22 figs. It was found, it is said, that by bathing commercial panchromatic plates in solution of 25 cc. ethyl-alcohol, 75 cc. water and 3 cc. of 20 per cent ammonia water for four minutes at 18 deg. cent. and drying rapidly, speed to white light was increased 100 per cent in nearly all cases and sensitivity in red extended one hundred or more Angström units.

Sensitometer. A New Non-Intermittent Sensitometer, Loyd A. Jones. Jl. Franklin Inst., vol. 189, no. 3, Mar. 1920, pp. 303-329, 13 figs. Time-scale instrument giving continuous exposures with intensity constant and time variable developed for testing of photographic plates at research laboratory of Eastman Kodak Co.

[See also CAMERAS.]

PHOTOMETERS

Micro. See MICROPHOTOMETERS.

Photoelectric. A Photoelectric Photometer, Arthur H. Compton. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 28-33, 1 fig. Use of thermionic amplifier to increase current readings of photoelectric cells is suggested, also filter to reduce proportion of blue light and render indications proportional to photometric value. With such equipment, lamps are compared by varying their distances to cell, until deflection of galvanometer is the same as that given by standard lamp.

Photometric Integrator. A Universal Photometric Integrator, Frank A. Benford. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 19-27, 12 figs. Apparatus for testing military searchlights. It consists of photometer track 150 ft. long on which rides hemispherical light-collecting shell with small portable-type photometer attached and system of curtains along track to absorb stray light.

Weber, Use of. Suggestion in Regard to Manner of Using Weber Photometer (Contribution à l'emploi du photomètre de Wéber). Société belge des Électriciens, vol. 33, July-Sept. 1919, pp. 185-187, 2 figs. Connecting in series the two incandescent lamps which are used as standards.

PHOTOMETRY

Color Equalization in. A New Device for the Equalization of Color in Connection with Photometric Measurements (Eine neue Vorrichtung zum Farbausgleich bei photometrischen Messungen), H. v. Voss. Zeitschrift für Beleuchtungswesen, Heizungs- u. Lüftungstechnik, vol. 25, no. 11-12, June 1919, pp. 53-57, 9 figs. Writer describes his new filter method which he claims has the advantage of requiring only a single, simple filter arrangement which can be conveniently and quickly adopted to any source of light. Description and illustration of device used by Siemens & Halske in connection with this filter arrangement for equalization of color.

Heterochromous. Heterochromous Photometry Permitting Physical Measurement of Luminous Intensity (Sur une solution de la photométrie hétérochrome permettant une mesure physique de l'intensité lumineuse), A. Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 830-835. Luminous source of bolometer or thermo element received inversely on spectroscope.

PHOTOPHONES

Operation of. On Recording and Reproducing Sounds by Means of Light, A. O. Rankine. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 78-83, 3 figs. Light from photophone transmitter described in Physical Soc. of Lond. Proc., vol. 31, p. 242, is concentrated on narrow slit, an image of which is produced by means of auxiliary lens on strip of cinematograph film, slit image being transverse to film. Variations in intensity of light when sound waves are received by instrument are recorded as variations in density of film after development.

Rankine-Bell. Bell's "Photophone" made Practical. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 13-15, 7 figs. Arrangement and action of Rankine's improvement. Apparatus in form given was used for British war signals.

PHOTOTELEGRAPHY

Method. Method for Conversion of Light Rays into Code Characters for Phototelegraphy (Anordnung zur Umwandlung von Lichtstrahlen in Schriftzeichen für Lichttelegraphie), Georg Schmidt. Elektrotechnischer Anzeiger, vol. 36, no. 90, Aug. 26, 1919, pp. 420-422, 1 fig. Details of new method and device for converting rays of light by means of selenium or similar photoelectric cells into mechanical work. Discovery, it is set forth, is for purpose of establishing by means of differential connection system, electric connection in one or more local circuits under any lighting conditions either by day or night.

PHOTOTELEPHONY

New Apparatus for. New Apparatus for Phototelephony (Neue Apparate für Lichttelephonie), Hans Thirring. Physikalische Zeitschrift, vol. 21, no. 3, Feb. 1, 1920, pp. 67-73, 5 figs. Description of transmitting and receiving apparatus developed as result of author's experimental work in collaboration with Simon and completed by him after Simon's death.

PHOTOTOPOGRAPHY

Aerial. Aerial Photo-Topography, R. Preston Wentworth. Aerial Age, vol. 10, nos. 7 and 8, Nov. 10, 17 and 24, Dec. 1, 1919, pp. 245-246 and 295-296, 4 figs. Illustrating process of compiling aerial photographic map. Qualifications of camera needed for this kind of work.

PICRIC ACID

Manufacture. The Manufacture of Picric Acid by the Nitrate Method, D. H. B. Wride. Arms & Explosives, vol. 27, no. 327, Dec. 1, 1919, pp. 154-155, 1 fig. Description of direct use of sodium nitrate in nitration of phenol.

PIERS

Coal. Jersey City Coal Pier 1,100,000 Yd. Hydraulic Fill. Public Works, vol. 48, no. 9, Mar. 13, 1920, pp. 187-188. Slip 30 ft. deep and large, high fill made by 22-in. suction dredge.

New Coaling Pier at Woolwich Arsenal. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 701-703, 2 figs. Pier is built of reinforced concrete.

Vertical Curves for Coal Piers and Hump Yards. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 208-209. Particulars of recent practice are said to be sharp circular and para-

bolic curves connecting steep grades of cable and gravity inclines.

Concrete, Disintegration of. Ocean Pier to be Scrapped Because of Concrete Disintegration. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 621-623, 3 figs. It is believed that underlying cause of present condition was porous and permeable concrete which permitted salt water to penetrate into the concrete casting, causing its chemical disintegration and mechanical fracture as well as expansion of reinforcing steel due to its corrosion.

Concrete, Panama Canal. The Panama Terminals, J. F. Springer. Sci. Am., vol. 122, no. 6, Feb. 7, 1920, pp. 130-131, 4 figs. Reinforced-concrete pier construction at ends of canal.

Concrete Roof Trusses for. Precast Concrete Roof Trusses in Panama Pier Shed, Guy W. True. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1232-1238, 9 figs. Discussion of feasibility of concrete roof trusses with comparisons of cost data between two similar sheds, one with reinforced-concrete roof trusses and one of structural steel.

Design. Pier Design for Ocean and Lake Terminals, H. McL. Harding. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 523-528, 11 figs. It is advanced that single-unit piers about 700 ft. long to be used by freight-carrying ships should be 140 ft. to 150 ft. wide, with slips 280 ft. to 300 ft. wide. Suggestions are made in regard to equipment to install.

Jersey City. Plan Piers of Record Length for Terminal at New York. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 970-973, 4 figs. Lehigh Valley Railroad starts building first unit of three piers, each 7000 ft. long, to carry extensive trackage. First wharf will have ore and general freight-handling facilities.

Marine Terminals. See TERMINALS, MARINE, Piers.

New York City. $50,000,000 Pier Improvement Will Give New York 18 Modern Piers. Mar. News, vol. 7, no. 4, Sept. 1920, pp. 112-114, 2 figs. Plans approved by Sinking Fund Commission. Plans provide for building of 18 piers from 950 to 1025 ft. in length along North River between Vesey and Perry streets, replacing 32 erected in 1871. Work is expected to be started in spring of 1921.

Reinforced-Concrete. See Coal.

Seattle. Ease of Operation Governs Design of New Seattle Pier, George F. Nicholson. Eng. News-Rec., vol. 84, no. 23, June 3, 1920, pp. 1101-1103, 4 figs. New pier is 365 ft. wide and 2560 ft. long, and when completed, will cost $2,500,000. Experience on similar adjacent pier led to different shed and track arrangement and special crane.

Staten Island. New Steamship Piers on Staten Island are Too Narrow, John Meigs, William S. Wilgus, Frank G. White, Fay, Spofford & Thorndike, Frederick W. Cowie and George F. Nicholson. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 160-165. Opinions of leading port and terminal engineers.

[See also TERMINALS, MARINE, Piers.]

PIEZOELECTRICITY

Rochelle Salt Crystals. The Piezo-Electric Effect in the Composite Rochelle Salt Crystal, A. McL. Nicolson. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1315-1335, 20 figs., partly on two supp. plates. Exposition of piezo electricity and related optical and other properties belonging to these crystals. Special reference is made to comparatively large piezo electric effects produced by Rochelle salt crystals, prepared so as to develop natural composite structure.

[See also TELEPHONES, Crystal.]

PIG IRON

See IRON, PIG.

PIGMENTS

Colloidal. Colloidal Pigments in the Mineral Kingdom (Ueber kolloide Färbemittel im Mineralreich, C. Doelter. Kolloid-Zeitschrift, vol. 26, no. 1, Jan. 1920, pp. 23-27. Discussion of theory that change in color of certain minerals through radium radiation depends on dispersive power of colloidal coloring particles, and notes on chemical nature of pigments in connection with various minerals.

PILE DRIVERS

Steam Hammers. A New Method of Driving Piles. Public Works, vol. 49, no. 6, Aug. 7, 1920, pp. 136-138, 3 figs. Account of driving reinforced-concrete piles 44 ft. long and 16 in. square by doubleacting no. O "Union" steam hammer making 110 strokes per minute and operated by three-drum, three-spool 60-hp. Lidgerwood steam hoisting engine on platform of special steel tower.

PILES

Concrete-Coated Wood. Wood Piles Coated with Concrete Applied by Cement-Gun. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 225-226, 4 figs. Case in Porto Rico is mentioned where pre-coated piles were found in good shape six years after driving.

Concrete, Self-Sinking. A New Self-Sinking Concrete Pile. Engineer, vol. 128, no. 3333, Nov. 14, 1919, pp. 498-499, 2 figs. Built as beam with reinforcement and having in its center duplex conduits feeding series of water jets, a large one which does excavational work and a number of smaller jets which help to clear away spoil and at the same time to facilitate vertical movement of pile by overcoming frictional resistance of surrounding earth, sand, gravel, etc.

Creosoted. A Conclusive Record for Creosoted Piles. Ry. Maintenance Engr., vol. 16, no. 1, Jan. 1920, pp. 23-25, 4 figs. Three-mile approach on Indiana end of Louisville & Nashville bridge over Ohio river at Henderson, Ky., of which 177 bents at south end were built of creosoted, long-leaf, yellow pine piles has had, it is said, a useful life of 35 years.

Long Life for Creosoted Piles in Railroad Trestle. Ry. Age, vol. 68, no. 3, Jan. 16, 1920, pp. 247-249, 6 figs.

Interlocking Steel. Making Interlocking Steel Piling Watertight, W. T. Christine. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 27-28, 1 fig. By driving combination of sheet steel piling and heavy timbers along face of wall about 5 ft. outside the wall and in line with it.

Sheet Piling. Experiences with Steel Sheet Piling in Sea and Harbor Work (Erfahrungen mit eisernen Spundwänden in See- und Hafenbau), H. Prüss. Zentralblatt der Bauverwaltung, vol. 40, no. 33, Apr. 24, 1920, pp. 205-207, 6 figs. Experiences are said to show that up to about 7 to 8 m. water depth the tied-back sheet piling serves as a useful and rapidly constructed vertical shore protection of sufficient life, which can be favorably compared with quay walls and similar constructions also in regard to construction cost.

Tests of Solid and Laminated Wood Sheetpiles. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1201-1202. Tests made at Cornell University on quarter-scale models under bending loads.

Steel. See Interlocking Steel.

PINE

Crushing Strength. Crushing Strength of South-

ern Pine at Angles to Grain, Q. C. Ayres. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 653-654, 2 figs. Comparative plots of results of tests and of Jacoby and Howe formulæ for same terminal values.

PIPE

Bending. Bending of Pipes with Thin Walls (Hohlbiegen schwachwandiger Röhren). Metall-Technik, vol. 45, no. 49-50, Dec. 18, 1919, pp. 195-196, 11 figs. Cause of failures in pipe bending is said to be due to very different kinds of stressing at same time and on same pipe section; soft material, however, is not always easiest to bend, but it is of great importance that a whole section of pipe be of equally soft or hard material.

Bending, Machines for. Pipe Bending Machines, R. P. Deane. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 448-450, 7 figs. Discusses principles employed in bending pipe and gives details of some machines used in making pipe bends, coils, plumbers' fittings, etc., from both iron and brass pipe and tubing.

Cast-Iron. See PIPE, CAST-IRON.

Concrete. See PIPE, CONCRETE.

Corrosion Prevention. Four Years' Experience in Prevention of Corrosion of Pipe, F. N. Speller and W. H. Walker. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 97-102, 2 figs. Illustrates arrangement of piping and filters in deactivating plant of 12-story apartment building.

Drain. See PIPE, DRAIN.

Lead. See PIPE, LEAD.

Steel. See PIPE, STEEL.

Stresses in. The Stressing of Freely Supported Filled Pipes Caused by the Weight of Liquid (Die Beanspruchung freitragender gefüllter Rohre durch das Gewicht der Flüssigkeit), D. Thoma. Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 5, Feb. 20, 1920, pp. 49-52, 9 figs. Shows that for a considerable distance from a flange, or otherwise supported cross-section, a pipe is able to resist the unequal internal pressure, without exceeding the bending strength of the walls.

Welded Joints vs. Fittings. Oxy-Acetylene Welding of Pipe Mains, Alfred S. Kinsey. Acetylene Jl., vol. 21, no. 11, May 1920, pp. 720-724, 12 figs. One of important uses of welding is said to be in construction of pipe systems with joints welded together instead of being made up by fittings. Writer gives illustration of this in new pipe line just completed near Philadelphia for purpose of supplying Montgomery and Delaware counties by-product gas.

PIPE, CAST IRON

Cement Joints for. Cement Joints for Cast Iron Water Pipe, George W. Pracy. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 436-439. It is pointed out that cement joints increase electric resistance of pipe, a feature of particular importance in larger cities where electrolytic action does considerable damage. Other advantages lead writer to believe cement joint has come to stay.

Centrifugally Cast. Centrifugally Cast Pipe in South America. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 863-865, 7 figs. Account of new plants in Brazil and Argentine using the DeLavaud process of iron pipe. Notes on method of tapping hot iron from cupolas at plant in Buenos Aires.

Corrosion. Corrosive Action of Soils on Iron and Lead, L. A. Stenger. Chem. & Metallurgical Eng., vol. 22, no. 21, May 26, 1920, pp. 965-968, 1 fig. It is concluded from field and laboratory experiments that electrolysis of underground structures may be caused by definite conditions which are determinable by electrical measurements and study of environments. Method is suggested for prolonging life of iron structures in given soils. Long life of cast iron, it is pointed out, is due to its greater wall thickness.

Flanges. Investigation of Question of Flanges for Light Cast Iron Pipe, John Knickerbacker. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 457-472, 12 figs. Sketches showing in full size thickness of pipe and thickness of flanges for Am. Water Works Assn. classes A, B, and C pipe, flanges for these pipes being calculated by formula which established that thickness of flanges equals one and one-half times thickness of pipe plus one-eighth of an inch. Reference is made to report of Committee on Light Flanges of The American Society of Mechanical Engineers presented at annual meeting in Dec. 1919.

Joints. Cast Iron Pipe Joints. Gas Industry, vol. 20, no. 2, Feb. 1920, pp. 43-46. Report of Committee appointed by American Gas Association to prepare satisfactory design for joints for cast iron mains. New design of bell for tentative alternating standard is recommended.

Cast Iron Pipe Joint Tests Made at Schenectady, Victor Starzenski. Gas Age, vol. 44, no. 9, Nov. 1, 1919, pp. 383-387, 10 figs. Results of investigations of various types of joints for gas mains. It was concluded that cement joints on 12-in. pipe were perfectly satisfactory up to 2 lb. working pressure, also that cement joints might be made satisfactory at pressures up to 25 lb., but under ordinary working conditions writer felt "somewhat apprehensive of the results"; combination cement and lead joint was found to be a perfect joint under ordinary circumstances.

Recommend Deeper Bell and Elimination of Lead Groove for Cast Iron Pipe to Be Jointed with Cement. Am. Gas Eng. Jl., vol. III, no. 19, Nov. 8, 1919, pp. 444-446. Object sought is to take advantage of sheer resistance of cement being greater than strength of bond. Report of Cast Iron Pipe Joints Committee of Am. Gas. Assn.

PIPE, CONCRETE

Centrifugal Process. The Manufacture of Concrete Pipes by "Hume" Centrifugal Process, W. Wolstenholme. Jl. South African Instn. Engrs., vol. 18, no. 10, May 1920, pp. 175-181 and (discussion) pp. 181-184, 8 figs. Process at factory of Hume Pipe Co., Germiston, South Africa.

Joints. New Type of Concrete Pipe Joint. Concrete Products, vol. 19, no. 3, Sept. 1920, pp. 31-32, 4 figs. Machined castings used for bell and spigot rings.

Manufacture. Manufacturing Concrete Pipe with Compressed Air, F. A. McLean. Concrete Products, vol. 18, no. 6, June 1920, pp. 19-20, 3 figs. Three principal advantages of pneumatic ramming in manufacture of concrete pipe are said to be (1) considerably more pipe can be turned out each day, (2) superior grade of pipe having greater density and uniformity can be made, and (3) absence of physical strain on operator and use of a cheaper grade of labor than is possible with old methods.

Pressure, Tests of. Reinforced Concrete Pressure Pipe Test. Concrete Products, vol. 18, no. 2, Feb. 1920, pp. 13-15, 3 figs. Service tests of Meriwether reinforced-concrete pressure pipe which is designed for use in water conduits, power-house and similar work requiring water-tight pipe.

See also Hume.

[See also CONDUITS, Concrete; SEWERS, Concrete, Specifications for.]

PIPE COVERINGS

Theory of. Heating and Ventilating Research Work, M. Kinoshita. Domestic Eng & Estate Engr., vol. 40, no. 18, June 1920, pp. 86-87, 1 fig. Deals with theory of pipe covering. Most important point is said to be that efficiency is not proportional to thickness, and for calculation of heat-saving efficiency, thickness of coating must be taken well into consideration to produce most economical net result. Abstract of research carried out at London University by committee of Instn. of Heating & Ventilating Engrs.

PIPE, DRAIN

Tests. Supporting Strength of Drain Tile and Sewer Pipe Under Different Pipe-Laying Conditions, W. J. Schlick. Iowa State College of Agriculture & Mechanic Arts Official Publication, vol. 18, no. 46, April 14, 1920, 68 pp., 26 figs. It was determined that supporting strength of pipe in ditch depends quite largely upon area of foundation to which load on pipe is transmitted and uniformity of distribution of pressure over this area. Factor of safety of 1½ was found to be both necessary and sufficient to prevent cracking. Pipe-laying methods are classified into "ordinary," "first class" and "impermissible." Supporting strength of pipe laid according to each of these methods was determined.

PIPE FITTINGS

Cast-Steel. Fittings and Flanges of Cast Steel, Edwin F. Cone. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 393-395, 3 figs. New shop of Reading Steel Castings Co., Reading, Pa., where fittings and flanges are cast in green sand.

PIPE, GAS

See GAS PIPE.

PIPE JOINTS

See PIPE, CAST-IRON, Joints; PIPE, CONCRETE, Joints.

PIPE LAYING

Lowering in Sea. Sea Water for Oil Refinery Condensers Secured by Gravity, Leon H. Watts. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 324-325, 4 figs. Thirty-inch cast-iron pipe extending 850 ft. to sea lowered from trestle as one length. Water jets used to dig trenches.

Machine for. See CONDUITS, Concrete.

PIPE, LEAD

Corrosion. See PIPE, CAST-IRON, Corrosion.

Extrusion of. The Extrusion of Lead Pipe, Ellsworth Sheldon. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 909-913, 10 figs., and vol. 52, no. 2, Jan. 8, 1920, pp. 59-62, 9 figs. Nov. 26-Dec. 4: Possibility of extruding iron is mentioned and notes are added on lead refining and alloying and making shrapnel balls. Jan. 8: Details of trap extruding machine.

PIPE LINES

Color Schemes. Color Schemes for Distinguishing Plant Piping, H. L. Wilkinson. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 385-390. Report of Committee on Identification of Power House Piping.

Design. Factors in Design of Sluices and Pipe Lines for Hydraulicking, F. A. Goodale. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 590-591, 2 figs. Empirical formula for estimating amounts flume will carry and grade to use. From Colo. School of Mines Magazine.

Havre-Paris. Havre-Paris Pipe Line (La pipe line Havre-Paris). Outillage, vol. 173, nos. 37 and 38, Sept. 16 and 23, 1920, pp. 570-574 and 586-589, 11 figs. Details of construction and operation of pipe lines in Roumania, England and Mexico, are studied as preliminary basis for designing Havre-Paris pipe line.

Hydraulic. See HYDRAULIC TURBINES, Pipe Lines, Minimum-Cost.

Natural-Gas Transportation. Pipe Lines for Transporting Natural Gas, Clifford E. Brock. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 445-447, 4 figs. Construction, repair and operation of jointed and welded lines, including particulars regarding couplings used, pipe-laying machines, strength of welded pipe, pressure regulation, etc.

Oil. Crude Oil and Kerosene (La mazout et le pétrole lampant), Auguste Pawlowski. Génie Civil, vol. 76, no. 16, Apr. 17, 1920, pp. 365-370, 3 figs. Notes on importation of fuel oil into France, particularly on projected pipe line from Havre to Paris.

Oil Pipe Lines, C. P. Bowie. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2164, Sept. 1920, 4 pp. Operation of pipe-line system.

Oil Pipe Lines, S. A. Sulentic. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 883 and 914. Writer compares cost of pipe-line transportation with that of rail and canal and shows advantages of oil engine and means of economically transporting oil for long distance through pipes. Derives formulæ for calculating pressure, net horsepower and brake horsepower necessary for transmission of any quantity of oil per day through pipe of known diameter.

The Hydraulics of Oil Pipe Lines, W. F. Durand. Jl. Electricity, vol. 44, no. 9, May 1, 1920, pp. 434-439, 1 fig. Formula expressing loss of head in terms of length and diameter of pipe line, velocity of flow, and viscosity and density of liquid, is discussed and interpreted.

Oil, Capacity Requirements. Oil Pipe Line Transmission, H. W. Crozier. Jl. Electricity, vol. 44, no. 3, Feb. 1, 1920, pp. 106-108, 3 figs. Capacity required of pipe line in order to handle several different grades of oil.

Oil-Transmission. Pipe-Line Transmission of Crude Oil. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1039-1045 and 1072-1073, 12 figs. Development of California systems with special notes on methods of flow measurement.

Submarine. Bayonne Submarine Pipe Line, Francis H. Sherrerd. Fire & Water Eng., vol. 66, no. 26, Dec. 24, 1919, pp. 1220-1221 and 1225, 5 figs. Methods used in laying 1800-ft. flexible joint submarine pipe.

Thawing Machine. Description of Motor-Driven Portable Thawing Machine Mounted on Truck, Frank J. Gifford. N. E. Water Works Assn. Jl., vol. 34, no. 2, June 1920, pp. 114-119 and (discussion) 119-124, 5 figs. Apparatus for thawing purposes on small pipe lines, designed to use reduced voltage, and discover some of the limitations in this direction.

Underground, Detection of. Method of Detecting Underground or Covered Metal Pipes and Conductors (Verfahren zur Auffindung unterirdisch oder verdeckt verlegter, metallischer Leitungen), Max Dieckmann. Elektrotechnische Zeitschrift, vol. 41, no. 22, June 3, 1920, pp. 435-436, 4 figs. With aid of rapid electric oscillations. The high-frequency energy is transmitted from an exciter system to the desired conductor through induction, and the high-frequency field generated around pipe or conduc-

tor is located with an indicator sensitive to oscillations.

Water Hammer in. See WATER HAMMER.

Welding. Welding Pipe Lines. Gas Industry, vol. 20, no. 8, Aug. 1920, pp. 189-190. Comparison of oxy-acetylene welding of pipe lines with screw-threaded connections for oil-carrying purpose. It is said that oxy-acetylene welding has proved successful and costs less, saving of welding increasing as size of pipe is increased.

PIPE, STEAM

See STEAM PIPES.

PIPE, STEEL

Spirally Ribbed. The Manufacture of Pipes with Spiral Ribs and of Pipes for Exchange of Heat from Rolled Sections (Herstellung von Rohren mit Spiralförmig verlaufenden Rippen und von Wärmeaustauschrohren aus Walzprofilen). Autogene Metallbearbeitung, vol. 13, nos. 3 and 10, Feb. 1 and May 15, 1920, pp. 33-34 and 107-109, 10 figs. Feb. 1. Describes process in which they are made by winding a special T section around a mandrel and welding together the contiguous spirals. May 15. Describes construction of similar pipes patented by Chief Engineer Wiss of the Griesheim-Electron Chem. Factory.

PIPE THREADS

American and British. Discussion on American and British Pipe Threads, J. H. Rodgers. Can. Machy., vol. 13, no. 21, May 20, 1920, pp. 477-481, 10 figs. It is pointed out that ultimate test of any standard thread is its successful application in commercial manufacture and use for long period of years, and that American standard has met this test in every respect. The profile of thread, pitch, length of thread, system of gaging, each contributes a share to its success, and it lends itself most admirably to large quantity production, and an interchangeable product is more easily produced than with any other pipe standard in existence. Extract from finding of committee of manufacturers of pipes, valves and fittings, following conference in Paris in reference to adoption of international standard.

Standard. Gauging American Standard Pipe Threads, J. H. Rodgers. Can. Machy., vol. 23, no. 8, Feb. 19, 1920, pp. 195-198, 15 figs. Summary of revised formulation of Briggs' standard and gaging system adopted by different manufacturers of pipes, valves and fittings.

PIPE, WOOD-STAVE

Discharge from. See FLOW OF WATER, Wood-Stave Pipe.

Spirally-Reinforced. The Use of Wooden Pressure Pipe in Norway (Die Anwendung von hölzernen Druckleitungen in Norwegen), A. H. Lem. Schweizerische Bauzeitung, vol. 76, no. 9, Aug. 28, 1920, p. 101, 6 figs. Describes spirally reinforced pipes manufactured in factory in lengths of 5 m.; and continuous pipes which are put together from wood-staves at place of installation, only the parts being fabricated in factory.

PIPE, WROUGHT-IRON

Manufacture. Manufacture of Wrought Iron Pipe, N. Boland. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 844-849, 20 figs. Description of various steps in production of wrought-iron pipe, beginning with puddling process and ending with inspection.

PIPES

Design of Pipe Under High Head. Method of Procedure in Economical Design of a Pipe Under High Head, E. W. Rettger. Eng. & Contracting, vol. 54, no. 6, Aug. 11, 1920, pp. 129-130. Formulæ are presented and their application explained.

Flame Propagation in. Report on Propagation of Flame in Pipes and Effectiveness of Arresters Including Gasoline, Ether, Alcohol, Acetone, Amyl Acetate and Light Oil, A. H. Nuckolls. Underwriters' Laboratories, special investigation no. 528, Oct. 1, 1919, 64 pp., 16 figs. It was found that propagation of flame in vapor-air mixtures of gasoline, ether, acetone, alcohol, amyl acetate and light oil depends upon proportion of vapor in air and is influenced by length and size of containing pipe. Propagation is said to set up undulations or pressure impulses in pipe where ratio of length to diameter is large.

Strength Testing. New Method of Testing the Strength of Metal Pipes (Nouvelle méthode d'essai de fragilité des tubes métalliques), Charles Fremont. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 18, Nov. 3, 1919, pp. 776-779, 10 figs. Collar of pipe held between special bushings is subjected to dynamic flexure by blows of hammer.

Underground, Electrolysis of. See ELECTROLYSIS, Underground Pipes.

Water. See WATER PIPES.

PIPING

Calculations for. A Graphic Method for the Calculation of Steam and Air Piping (Eine allgemeine graphische Methode, angewendet bei der Berechnung der Dampf- und Luftleitungen), Alexander Fischer. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 36, Dec. 30, 1919, pp. 391-393. Description of a general method by means of which it is said to be possible to make calculations of quantities and in which the functional relationship between quantities is given in the form of a diagram or table of figures. In complicated cases in connection with the logarithmographic method of Mehmke it is said to arrive at results rapidly.

Power, Layout of. Power Piping, J. Roy Tanner and George J. Stuart. Proc. Engrs. Soc. Western Pa., vol. 35, no. 7, Oct. 1919, pp. 311-332 and (discussion) pp. 333-347. General discussion of details of construction of a piping system, noting importance of its efficient operation in order to secure successful running of machinery. Suggestions are given in regard to selecting pipe sizes, locating headers and manner of designing branches.

Power-Plant. Design and Construction of Power-Plant Piping, John D. Morgan. Power, vol. 51, no. 20, May 18, 1920, pp. 797-799, 2 figs. Suggestions regarding design and construction of piping, including materials used, valves, fittings and types of joints for various pressures and temperatures.

See also ROLLING MILLS, Power Piping in.

PISE

See BUILDING CONSTRUCTION, Rod Pisé Construction; HOUSES, Pisé de Terre.

PISTON RINGS

Centrifugal Casting of. Piston Rings Cast Centrifugally, H. E. Diller. Foundry, vol. 48, no. 4, Feb. 15, 1920, pp. 127-132, 13 figs. Molds are made in round cast-iron flasks with layers of cores, and castings are entirely surrounded with sand. Centrifugal pressure is said to produce iron of dense structure. Foundry, it is said, contemplates installation of electric furnace for melting metal.

Locomotive. Piston Ring Work in a Railroad Shop, Frank A. Stanley. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 426-427, 5 figs. Methods of making packing rings for locomotive pistons and piston valves as practised in railroad shop on Pacific Coast.

PISTONS

Aluminum-Iron. Manufacturing Methods for an Aluminum-Iron Piston. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1270-1273, 12 figs. Methods necessitated by reason of different expansions of two metals.

Aluminum, Design of. Aluminum Piston Design, E. G. Gunn. Jl. Soc. Automotive Engrs., vol. 5, no. 6, Dec. 1919, pp. 426-428, 11 figs. Also Automotive Industries, vol. 42, no. 5, Jan. 29, 1920, pp. 362-364, 11 figs. Experiments are claimed to have established that piston slaps can be overcome by using proper clearance and that when oil is properly controlled oil consumption is very low even with rings having up-and-down clearance of 0.004 in.

Locomotive. The Use of Bronze for Valve Snap Rings and Piston Surfaces, and Bull Rings in Large Cylinders, to Prevent Rapid Wear and Cutting of Cylinder and Valve Bushings, C1. E. Fuller. Can. Ry. & Mar. World, no. 262, Dec. 1919, pp. 641-642, 2 figs. Constructional features of common standard bronze-face 29½-in. piston and rod, Union Pac. Road.

Machining. Boring and Facing Pistons in a Lathe. Machy. (Lond.), vol. 16, no. 393, Apr. 8, 1920, pp. 12-13, 4 figs. Description of special equipment for performing preliminary operations on pistons in an engine lathe.

Interesting Tool Set-Ups for Turning of Pistons, J. H. Moore. Can. Machy., vol. 23, no. 23, June 3, 1920, pp. 526-527, 4 figs. Presents data on one of systems used by the Jones & Lamson Machine Co. on their Fay automatic lathe, main features of which are said to be simplicity of tooling, small number of operations, and performing of operations automatically wherever possible, thus allowing use of unskilled labor.

See also AUTOMOBILE ENGINES, Pistons.

Manufacture of. The Manufacture of Pistons in a Medium Sized Factory, J. Edward Schipper. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 767-771, 6 figs. How it is possible in plant making 50 engines daily to use regular standard tools to advantage of production work.

PITCH

Recovery of. See NITER, Recovery of.

PITOMETER SURVEY

See WATER SUPPLY, Waste Prevention.

PITOT TUBES

Integrating. Integrating Pitot Tube for Measuring the Mean Velocity of Variable Currents (Sur un tube de Pitot intégrateur pour la mesure de la vitesse moyenne des courants variables), Ives Delage. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 4, Jan. 26, 1920, pp. 213-218, 2 figs. Scheme for maintaining upper end of tube exactly in level of water.

[See also FLOW OF WATER, Measurement of.]

PLANERS

Cincinnati. Improvements Embodied in Cincinnati Planers, John H. Van Deventer. Am. Mach., vol. 51, no. 16, Oct. 16, 1919, pp. 717-721, 9 figs. Concerning embodiment of forced lubrication, quick power traverse, herringbone gears, box-type beds and tables, and other modifications in standard planing machine.

Driving Gears. See GEARS, Planer Driving.

Housings. Recent Machine Tool Developments, Joseph Horner. Engineering, vol. 108, no. 2809, Oct. 31, 1919, pp. 570-574, 18 figs. Designs of housing used for planing machines and plano-millers.

Special. See MACHINE TOOLS, Special.

Widening. Can You Widen Your Planer to Advantage, Donald A. Hampson. Can. Machy., vol. 23, no. 21, May 20, 1920, pp. 487-488, 4 figs. Tells how one firm widened their 24-in. planer 3 in. on each side to accommodate larger work. Construction and details of lining up are given.

PLANING MACHINES

See PLANERS.

PLASTIC MATERIALS

Softening of. The Softening of Plastic Materials Determined by the Widney Resiliometer and Expressed Graphically, Alan Speedy. Jl. Soc. Chem. Industry, vol. 39, no. 2, Jan. 31, 1920, pp. 18T-20T, 4 figs. Describes and illustrates instrument used for carrying out test, which was manufactured by Widney Co., Chicago.

PLATES

Fixed, Deflection of. Elementary Solution of Fixed Rectangular Plate Carrying Load Uniformly Distributed or Concentrated at its Center (Solution élementaire de la plaque rectangulaire encastrée portant une charge uniformement repartie ou concentrée en son centre), M. Masnager. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 23, Dec. 8, 1919, pp. 1081-1083. Derivation of trigonometric series by considering components in various directions of vertical deflection of plate.

Flat, Strength and Stiffness of. The Strength and Stiffness of Flat Plates, F. H. Hummel. Mech. World, vol. 67, no. 1732, March 12, 1920, pp. 172-173. Table giving maximum deflection at center, stress at center and maximum stress in plate for plates of different forms and dimensions.

Flat, Theory of. Theory of Elastic Netting and Its Application to the Calculation of Elastic Plates (Die Theorie elastischer Gewebe und ihre Anwendung auf die Berechnung elastischer Platten), H. Marcus. Armierter Beton, vol. 12, nos. 8 and 10, Aug. and Oct. 1919, pp. 181-190 and 245-250, 15 figs. Aug.: Discussion of plate having uniform loading. Oct.: Results of tests to confirm theory of flexibility of elastic plates. Discusses stresses in plates based on fracture theories, value of previously outlined plate tests, and tests with mild-steel plates.

Glass, Parallelism of. See GLASS, Plates, Parallelism of.

Stresses in. The Deflection of a Circular Plate Under a Concentrated, Eccentrically Applied Load (Die Durchbiegung einer exzentrisch durch eine Einzellast belasteten Kreisplatte), Ernst Melan. Eisenbau, vol. 11, no. 10, May 18, 1920, pp. 190-192, 2 figs. Determination of deflection in the case of a plate clamped at edge.

PLATINUM

Bibliography. Bibliography of the Metals of the Platinum Group, Jas. Lewis Howe and H. C. Holtz. Dept. of Interior, U. S. Geological Survey, Bul. 694, 1919, 558 pp. List of articles which have appeared in scientific literature from 1748-1917.

Deposits. Platinum. Can. Chem. Jl., vol. 3, no. 12, Dec. 1919, pp. 402-403. Properties, natural

occurrences, analytical tests possible in fields, metallurgy, and geological formations usually present where this metal is found.

Possibilities for Platinum in Western Canada, W. L. Uglow. Can. Min. Inst. Bul., no. 95, Mar. 1920, pp. 207-220. It is concluded from survey of platinum-bearing deposits that possibilities for future supply of metal are good. Rules are formulated for distinguishing rocks and ore bodies which may be possible carriers of platinum.

PLIOTRONS

See VACUUM TUBES, Pliotrons.

PLOWS

Motor. See MOTOR PLOWS; TRACTORS, German.

PLUMBING

Fixtures. The Essential Features of Sanitary Plumbing Fixtures. Am. Architect, vol. 116, no. 2287, Oct. 22, 1919, pp. 535-541, 11 figs. Together with suggestions for selecting such fixtures.

PLYWOOD

Glues for. See GLUES, Water-Resistant.

[See also AIRCRAFT CONSTRUCTION MATERIALS, Plywood; AUTOMOBILES, Plywood.]

PNEUMATIC TIRES

See MOTOR TRUCKS, Pneumatic Tires.

PNEUMATIC TOOLS

Armstrong-Whitworth Types. The Application of Pneumatic Tools in Modern Engineering Practice, J. W. Rogers. Eng. & Indus. Management, vol. 3, no. 19, May 6, 1920, pp. 591-592, 1 fig. Describes latest types of A. W. (Armstrong, Whitworth & Co.) pneumatic tools, especially the A. W. hammer weighing 17 lb. and having a 6½-in. stroke, which is said to be ideal tool for quick and efficient riveting.

Manufacture. How Pneumatic Tools Are Made, Their Treatment in Service and How to Obtain Maximum Efficiency in Their Work, H. S. Covey. Official Proc. Ry. Club of Pittsburgh, vol. 19, no. 2, Dec. 18, 1919, pp. 65-73 and (discussion) pp. 73-77. Association of pneumatic tools with railroad work is particularly pointed out.

[See also DRILLS, Pneumatic.]

POISONING

Industrial. Industrial Poisoning in British Works. Chem. Age, vol. 1, no. 17, Oct. 11, 1919, pp. 465-467. From annual report of Chief Inspector of Factories and Workshops for 1918.

POISONS

Industrial. Industrial Poisons. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 166-170. Consideration of poisonous properties of tellurium, based upon 13 cases examined and upon experimental work, together with bibliography of subject. Hexamethylene-tetramine as a poison in rubber industry, and industrial blood poisons in aniline manufacture are discussed.

POLARIMETERS

Half-Shade. The Theory of the Half-Shade Polarimeters (Zur Theorie der Halbschatten-Polarimeter), Hans Schulz. Physikalische Zeitschrift, vol. 21, no. 2, Jan. 15, 1920, pp. 33-38, 1 fig. Writer explains that there are two classes of half-shade polarimeters, those producing a strictly linear polarized light, and those capable of emitting elliptical polarized light. A source of error common to both classes is described, namely, the influence of the inclination of ray of light toward axis of apparatus. Report from the C. P. Goerz Optical Works, Berlin-Friedenau.

POLARIZATION

Alternating Current. Phenomena of Polarization in Alternating Current (Phénomènes de polarisation en courant alternatif), M. Vaillant. Journal de Physique théorique et appliquée, vol. 9, no. 5, Feb. 1919, pp. 46-62. Study of effects of dissymmetry in polarization phenomena, due to passage of feeble currents through voltameter having unequal electrodes.

POLE LINES

Telegraph and Signal-Service. Pole Lines for Telegraph and Signal Service, Stanley Rhoads. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 364-369, 2 figs. Method of calculating class and number of wood poles required for proper factor of safety in railroad service.

POLES

Cable-Carrying. Poles for Overhead Cables (Freileitungsmasten), B. Jacobi. Elektrotechnische Anzeiger, vol. 36, no. 89, Aug. 24, 1919, pp. 413-416, 7 figs. Determination of stresses due to (a) horizontal load, and (b) vertical load. Curves showing additional load caused by wind, ice, etc., are presented.

Calculation. The Calculation of Single and Double Wooden Poles with Bracket Insulators (Berechnung von hölzernen Einfach- und Doppelmasten mit Stützisolatoren), Paul Neumann. Elektrotechnische Zeitschrift, vol. 41, no. 21, May 27, 1920, pp. 407-409, 9 figs. Calls attention to inadequacy of the imperfect V.D.E. formula for top strength of simple supporting poles. A graphic method is given for the rapid determination of measurements for wooden supporting, terminal and corner poles, both single and double. Author recommends more extended use of double poles.

Cast-Iron, Reconstruction of. Reconstruction of Trolley Poles (La réparation des poteaux de trolley), Conchaudon and Jassaud. Industrie des Tramways et Chemins de Fer, vol. 13, no. 154-155-156, Oct.-Nov.-Dec. 1919, pp. 137-139, 2 figs. By pouring special mortar inside post after scraping rust, and reinforcing on the outside with six iron rods fastened to post with wire, French railway company is reported to have succeeded in reconstructing rusty iron posts.

Cedar, Life of. Natural Life of Cedar Poles, Page Golsan. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 257-258, 4 figs. Quantitative study of butt rot is claimed to have shown that cedar poles should last from 14 to 17 years. It is noted that mechanical strength is determined largely by side pull and it is advised that poles be well guyed.

Foundations. The Calculation of Pole Foundations (Zur Berechnung von Mastenfundamenten), W. L. Andrée. Eisenbau, vol. 11, no. 12, June 15, 1920, pp. 210-214, 4 figs. Refers to Fröhlich's work with same title describing the distortion of a foundation in the earth as shown by tests carried out under auspices of the German National Postal Bureau in 1913, which prompted author to develop the described special calculating method.

Preservative Treatment. Increasing the Life of Telegraph Poles (Ueber Freileitungsmasten und Mittel zur Erhöhung ihrer Lebensdauer), J. Schmidt. Elektrotechnischer Anzeiger, vol. 36, no. 76, July 24, 1919, pp. 353-354. Discussion of advantages and disadvantages of Rutgers' process.

Strength. Mechanical Resistance of Wooden Poles (La résistance mécanique des poteaux de bois), E. Picault. Journal Télégraphique, vol. 43, nos. 5 and 6, May 25 and June 25, 1919, pp. 65-67 and 81-84, 4 figs. Details of tests and graphs showing results.

[See also MASTS; TOWERS.]

POLES, CONCRETE

Ornamental. Ornamental Concrete Lamp Posts, Carl Edward Magnusson. Eng. Experiment Station, Univ. of Washington, Bul. no. 6, July 1919, 20 pp., 11 figs. Designs on campus of University of Washington.

POLES, STEEL

Latticed. The Calculation of Steel Poles (Die Berechnung von Gittermasten), E. Schütz. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 3, 5 and 7, Jan. 22, Feb. 5 and 19, 1920, pp. 23-27, 40-43 and 56-60, 7 figs. Results obtained by calculating the moments of inertia and resistance for standard angle-iron and U-iron sections at different distances apart with and without consideration of influence of the rivet holes, are given in tabular form and values thus obtained are said to effect great saving of time in calculation of latticed steel poles.

The Standardization of Steel Poles (Beitrag zur Frage der Eisengittermaste), N. Mennicken. Elektrotechnische Zeitschrift, vol. 41, no. 17, Apr. 29, 1920, pp. 331-332, 3 figs. Tells how standardization of steel latticed girder poles, improvement of static calculations and appearance, and economy of material can be effected by constructing portion carrying the cross-arms separate from the pole itself.

[See also ELECTRIC TRANSMISSION LINES, Steel Towers.]

POLES, WOODEN

Preservation. Pole Preservation, W. M. Leavitt. Jl. Electricity, vol. 45, no. 7, Oct. 1, 1920, pp. 321-322, 1 fig. Development of puncturing method. Paper read before Western Cedar Pole Preservers' Assn.

Poles for Overhead Line and Means for Increasing Their Life (Ueber Freleitungsmasten und Mittel zur Erhöhung ihrer Lebensdauer), J. Schmidt. Elektrotechnischer Anzeiger, vol. 37, nos. 67, 68-69, 73, 74, 78 and 79, Apr. 27, 29, May 6, 8, 15 and 18, 1920, pp. 289-290, 295-296, 319-320, 323-324, 339-340 and 345-346, 18 figs. Describes various impregnating methods and substances for treating wooden poles, as well as methods of reinforcing poles decayed at ground line, setting poles in concrete, etc.

POLISHING

Methods Used. Polishing Methods, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 203-210, 15 figs. Also in Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 409-416, 15 figs. Information concerning wheels, belts and abrasives used by Royal Typewriter Co.

POLYNOMIALS

Bernoulli. Bernoulli Polynomials (Sur les polynomes de Bernoulli), N. E. Nörlund. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 521-524. Their extension by considering analogous polynomials which depend on two variables.

Extension of Bernoulli Polynomials (Sur une extension des polynomes de Bernoulli), N. E. Nörland. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 14, Oct. 6, 1919, pp. 608-610. Properties of polynomials $B_\nu^{(n)}(x)$.

Symmetrical System. Symmetrical System of Polynomials (Un système symétrique de polynomes), L.-B. Robinson. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 524-526. Determination of conditions necessary and sufficient that a system composed of a number of integral equations and their polar equations may have solutions which do not cancel all determinants of matrix.

PORCELAIN

Shrinkage Equivalents. A Table of Porcelain Shrinkage Equivalents, L. M. Case. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 352-353. Gives equivalent of dimensions from 0.001 in. to 1 in. by thousandths, based on annual shrinkage of 0.1406 in. per inch for porcelain products.

Strength vs. Composition. Determination of Strength of Porcelain Masses and the Relation of the Calculated Strength to the Composition and Other Properties of These Masses (Festigkeitsbestimmungen von Steingutmasses und die Beziehungen der gewonnenen Festigkeitszahlen zur Zusammensetzung und anderen Eigenschaften dieser Massen), H. Harkort and A. Scherbius. Sprechsaal, vol. 52, no. 34, Aug. 21, 1919, pp. 297-300, 7 figs. Results of experiments are given and tables giving tensile and bending strength and relation of these to each other.

Talc, Use in. The Use of Talc in Porcelain Masses (Die Anwendung von Talk in Porzellanmassen). Sprechsaal, vol. 52, no. 42, Oct. 16, 1919, pp. 395-397, 2 figs. Advantages of talc or steatite for increasing durability, solidity, heat resistivity, translucency, etc., is said to be recognized. Talc, it is pointed out, can be used in large quantities in ceramic masses as substitute for clay without affecting their quality.

Tests. Tests for Laboratory Porcelain. Chem. Trade Jl., vol. 67, no. 1733, Aug. 7, 1920, pp. 187-188. Tests adopted by Sub-Committee on Porcelain of Glass Research Committee of Inst. of Chem.

Thermal Expansion. Further Studies on Porcelains, F. H. Riddle. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 812-827, 9 figs. Experiments at laboratories of Bur. of Standards to determine effect of variations in composition and of different methods of preparation. Other experiments were published in Jl. Am. Ceramic Soc., vol. 1, p. 606, 1918.

Relation Between the Composition and the Thermal Expansivity of Porcelains, F. H. Riddle. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 804-811, 1 fig. Experimental bodies high in clay substance showed low thermal expansions. Variations in flint content within narrow limits possible in such bodies did not indicate decided lowering of expansivity. As clay content of porcelains was lowered and amount of quartz became larger, its quantitative effect as regards thermal expansion became more marked.

PORTLAND CEMENT

See CEMENT, PORTLAND.

PORTS

Astoria, Mechanical Equipment of. Shipping Facilities of the Port of Astoria. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 104-109, 8 figs. Port of Astoria berthing space of wharves in harbor will be 11,714 linear feet. Constructional details of piers and description of mechanical equipment which will be installed are presented.

Boston, Development of. Big Boston Terminal Will Promote Port Development. Mar. Rev.,

vol. 50, no. 3, March 1920, pp. 133-136, 4 figs. Adaptation of $28,000,000 army supply base to handling commercial requirements.

Facilities for Handling Traffic. Port Facilities, Charles Evan Fowler. Freight Handling & Terminal Eng., vol. 6, no. 7, July 1920, pp. 265-268. Discussion of types of docks and piers and port equipment best suited for rapid handling of traffic. Paper read before Great Lakes-Tidewater Congress.

Kobe, Japan. Port Facilities at Kobe, Japan. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 87-89, 4 figs. With diagrammatic map showing arrangement.

Lorient, France. Lorient—A Fishing Port (Lorient, port de pêche). Bulletin technique du Bureau Veritas, vol. 2, no. 9, Sept. 1920, pp. 173-178, 5 figs. Project for modernizing port. It is intended to build suitable terminal facilities and cold storage plant and packing establishments, as well as railway terminals.

Material-Handling Equipment. See HANDLING MATERIALS, American Ports, Equipments of.

Mechanical Equipment. See also TERMINALS, MARINE, Freight-Handling Machinery.

Portland, Ore. Portland's Port Facilities, Municipal and Private. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 58-61, 4 figs. Indicating development plan of St. John's terminal.

Seattle. Plans of Port of Seattle Commission for Passenger Accommodations at Pier "B," Smith's Cove, G. F. Nicholson. Pac. Builder & Engr., vol. 25, no. 44, Oct. 31, 1919, pp. 17-19, 5 figs. Illustrations of terminals and mechanical equipment.

Port of Seattle and Its Achievements, First Paper, T. S. Lippy. Freight Handling and Terminal Eng., vol. 5, no. 11, Nov. 1919, pp. 409-411. Organization of Seattle Port Commission, which is a municipal corporation created to specialize wholly in harbor terminal facilities.

Vancouver, B. C. Port of Vancouver and Proposed Development, W. G. Swan. Can. Engr., vol. 39, no. 14, Sept. 30, 1920, pp. 381-382. Proposed improvement which is modelled upon Montreal harbor, involves widening and deepening First Narrows, and construction of dam and lock for Second Narrows. Paper read before Eng. Inst. of Canada.

POSTAL SERVICE

Mechanical Installations in England. Mechanical Installations in English Postal Service (Installations mécaniques dans le service postal anglais), M. Cabanne. Annales des Postes, Télégraphes et Téléphones, vol. 9, no. 2, June 1920, pp. 235-258, 14 figs. Description of London postal underground railway, organization of routine work in post offices and automatic pick-up apparatus.

POTASH

Blast-Furnace Gas as Source. Potash Recovery from Blast-Furnace Gases in England, Harold Hibbert. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 723-726. Together with notes on activities of Potash Production Bureau in cement dust and other fields. From Chemical Age.

Brine Cooling. A New Cooling Process for Potash Brine (Ein neues Kühlverfahren für Kalilauge), Ludwig Jung. Kali, vol. 13, no. 17, Sept. 1, 1919, pp. 281-285, 3 figs. Details of Balcke brine cooler are given. Cooler is said to possess advantages over box-cooling system, such as more rapid cooling, and economy in space as well as in cost of installation and operation.

Deposits, Alsace. The Potash Deposits of Alsace, Hoyt S. Gale. Dept. of Interior, U. S. Geological Survey, bul. 715-B, June 5, 1920, 55 pp., 9 figs. Deposits consist of sylvinite with very little other soluble material. Geology and conditions of deposits.

Deposits, German. Geology of German Potash Fields in Relation to Present Status of Research (Die Geologie der deutschen Kälisalzlager nach dem heutigen Stande der Forschung), Otto Krull. Kali, vol. 13, nos. 17 and 18, Sept. 1 and 15, 1919, pp. 274-281 and 296-304. Divergence of actual profile from van't Hoff's profile is pointed out. Theories of Rósza Walther, Carle, Everding, Boeke-Lachmann-D'Ans and Jänecke are propounded.

The Geology of the Central European Salt Beds (Allgemeine Geologie der Salziagerstätten Hans Höfer-Heimhalt. Berg- und Hüttenmännisches Jahrbuch, vol. 67, no. 4, 1919, pp. 219-274, 11 figs.; 1 on supp. plate. Notes on minerals and gases in salt beds; sources of mineral and potash salts; sedimentation caused by evaporation of water; origin of mineral and potash salt formations according to theories of various scientists; the formation of salt fields; potash salt formations in Central and North Germany, upper Alsace and East Galicia; the metamorphosis of salt formations. A profile is presented for identification of limestone salts in Central Germany.

Deposits, Texas. Large Potash Deposits Reported in Lakes and Basins of West Texas. Manufacturers Rev., vol. 76, no. 18, Oct. 30, 1919, pp. 119-120. Report of analysis of briny lakes and salt encrusted basins.

Kelp Distillation. Potash from Kelp. The Experimental Distillation of Kelp at Low Temperatures, G. C. Spencer. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 682-684, 1 fig. Sixteen distillations of dried kelp made in oil-jacketed wood retort at temperatures not exceeding 320 deg. cent. yielded, it is said, aqueous liquor, tar, and non-inflammable gas. Residual charcoal is believed to have been insufficiently heated either for good extraction of potash or for use as filtering medium.

Mechanical Handling. The Reclaiming of Potash from Store by Mechanical Means. Eng. & Indus. Management, vol. 2, no. 17, Oct. 23, 1919, pp. 542-544, 7 figs. Machinery for mechanical handling of chemicals in store houses.

Mines, Firedamp in. See FIREDAMP, Alsatian Potash Mine.

Nebraska Industry. Present Status of the Nebraska Potash Industry. Chem. & Metallurgical Eng., vol. 23, no. 12, Sept. 22, 1920, pp. 578-580. Observations on general conditions and probable future of industry. Historical note on discovery of potash in Nebraska Lakes. Need of improved technology in methods of operation. Current fuel and labor costs.

Recovery. Potash Recovery at Cement Plants, Alfred W. G. Wilson. Chem. Age, vol. 1, nos. 16 and 17, Oct. 4 and 11, 1919, pp. 437-439 and 462-464, 4 figs. Based on investigations carried out by writer in United States on behalf of Canadian War Trade Board.

Potash Recovery in New Jersey, R. Norris Shreve. Chem. Age, vol. 28, no. 5, May 1920, pp. 149-151, 2 figs. Description of large plant under construction for production of potash compounds from New Jersey greensands, which will turn out yearly somewhat over 20,000 tons of caustic potash or equivalent in other potash salts. Account of procedure of treatment and utilization of residuum.

Successful Potash Recovery at Cement Plant. Rock Products, vol. 23, no. 18, Aug. 28, 1920, pp. 17-20, 14 figs. Improvements to Cottrell electrical precipitation process at plant of Santa Cruz Portland Cement Co. Fine, dry potash salt is obtained direct from stock gases.

Utah. Potash Development at Sulduro, Utah, Harry R. Margetts. Monthly Jl. Utah Soc. Engrs., vol. 5, no. 6, June-July 1919, pp. 123-130, 4 figs. Preliminary solar evaporation is carried to about 70 or 75 g.p.l. KCl, then brine is taken to plant and by means of steam-heated grainers and evaporators concentration is completed.

Wood-Ash. Wood Ashes and Production of Potash, Ernest Bateman. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 615-619, 4 figs. Data on potash content of North American Woods. Details of manufacture of wood ash extract. Estimate of cost of manufacture.

POTASSIUM SALTS

Deposits. See MAGNESIUM SALTS, Deposits.

Permanganate. Manufacture of Potassium Permanganate, Raymond B. Stringfield. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1027-1030. Details for manufacture of potassium permanganate as carried on in southern California with description of analytical methods used in controlling process. Lines of research work are suggested.

Potassium Permanganate from Ferromanganese by Electrolysis, M. deKay Thompson. Chem. and Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 680-681. Experiments are said to have shown that it is possible to make potassium permanganate from commercial ferromanganese containing about 75 per cent manganese by electrolysis in potassium carbonate solution without necessity of ever cleaning anodes.

POTENTIAL DIFFERENCE

Measurement. Measuring Small Differences of Potential by Means of Lamp-Amplifiers (Emploi des amplificateurs pour la mesure des différences de potentiel faibles), R. Depriester. Revue générale de l'Électricité, vol. 6, no. 19, Nov. 8, 1919, pp. 619-620, 1 fig. Method using thermionic balance in open circuit and without differential galvanometer.

POTENTIALS

Cylinders. On the Potentials of Uniform and Heterogeneous Elliptic Cylinders at an External Point, N. R. Sen. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 226, Oct. 1919, pp. 465-479. Expression of potential in trigonometrical series.

Ionization and Resonance. Ionization and Resonance Potentials for Electrons in Vapors of Lead and Calcium, F. L. Mohler, Paul D. Foote, H. F. Stimson. Sci. Papers Bur. Standards, no. 368, Feb. 26, 1920, pp. 723-736, 2 figs. Resonance and ionization potentials in lead vapor were measured to be at 1.26 and 7.93 volts, respectively. Measurements in calcium vapor gave two resonance potentials, 1.90 and 2.85 volts, and observed value of ionization potential was 6.01 volts.

Retarded. Notes on the Retarded Potentials, Max Mason. Physical Rev., vol. 15, no. 4, Apr. 1920, pp. 312-316. Simple method of deriving the electromagnetic scalar and vector potentials.

POTENTIOMETERS

Telephonic Measurements. A New Alternating Current Potentiometer for Measurements on Telephone Circuits, P. O. Pedersen. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 523-525, 9 figs. Essential part consists of non-inductive combination of two resistances, coil and condenser, where $R_1 = R_2 = R = \sqrt{L/C}$ (ohms).

Uses in Pyrometry. Use of Potentiometer in Pyrometry, Chas. P. Frey. Am. Drop Forger, vol. 6, no. 7, July 1920, pp. 330-332, 5 figs. Fundamental units, the potentiometer, current determinations, movable coil galvanometer, potentiometers for pyrometry, standard cell and automatic compensation single scale.

POWDERED COAL

See PULVERIZED COAL.

POWER

Coal vs. Hydraulic Power. Coal and Water in the United States Compared as Sources of Power, R. S. McBride. Coal Age, vol. 18, no. 7, Aug. 12, 1920, pp. 343-344, 2 figs. Diagrams showing relation between sources of supply and points of use of bituminous coal, water-power possibilities of country and corresponding present demand for all classes of power.

Development in United States. A Study of Power Development and Suggestions for Future Progress, L. W. W. Morrow. Power, vol. 51, no. 23, June 8, 1920, pp. 922-924, 4 figs. Charts showing growth of annual coal consumption, horsepower used in manufacture, and central stations in United States.

Manufacture of. Energy as a Basic Commodity, Walter N. Polakov. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 232-239, 2 figs. Application of principles of multiple production and common carrier distribution.

Water-Motor. See Water Mains, Power from.

POWER FACTOR

Central Stations. The Power Factor of Central Stations (La question du facteur du puissance), Pierre Dumartin. Revue générale de l'Électricité, vol. 7, no. 20, May 15, 1920, pp. 643-656. Methods of improving power factor are discussed. Judicious combination of synchronous motors and phase compensators installed at places where energy is consumed, is preferred.

Correction. Power Factor Correction on Distribution Systems, D. M. Jones. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 648-657, 9 figs. Development of distribution, its relation to capital invested, and effect on losses.

Preventing Versus Correcting Poor Power-Factor, H. Goodwin, Jr. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 970-973, 3 figs. Suggestions for maintaining load and power-factor of induction motor.

Effect of. Power Factor and Distribution Problem, Sydney F. Walker. Coal Industry, vol. 3, no. 5, May 1920, pp. 243-245, 4 figs. Gives actual effect of "power factor."

Improvement. The Improvement of Power Factor, E. W. Dorey. Elec. Rev. (Lond.), vol. 85, no. 2198, Nov. 7, 1919, pp. 602-603, 2 figs. Patent using inductances in conjunction with static condenser.

Low, Cost of. The Cost of Low Power Factor, Will Brown. Power, vol. 51, no. 1, Jan. 6, 1920, pp. 24-26, 8 figs. Shows how by using synchronous motors to correct power factor large savings can be made in cost of power, generator capacity and copper loss.

Measurements. Accurate Methods of Measuring Power-Factor, C. V. Christie. Elec. News, vol. 29, no. 15, Aug. 1, 1920, pp. 32-35, 6 figs. Suggestions in regard to obtaining accurate records.

Measurement of Power Factor for Rates, C. E. Brown. Elec. World, vol. 75, no. 13, March 27, 1920, pp. 721-722, 5 figs. It is indicated how average power factor may be obtained over period of time by using standard watt-hour meters connected to register energy and reactive components of load.

Meters for. See AMMETERS.

Minima Values. Regulations for the Minima Values of cos ø under Full Load of Motors (Règlement pour les valeurs minima des cos ø à pleine charge des moteurs). Revue générale de l'Électricité, vol. 8, no. 2, July 10, 1920, pp. 50-51. Regulations adopted by Union des Syndicats de l'Électricité on April 14, 1920.

Polyphase Circuits. Power Factor in Polyphase Circuits. Jl. Am. Inst., Elec. Engrs., vol. 39, no. 6, June 1920, pp. 538-546, 8 figs. Symposium of annual conference papers. A preliminary report of special joint committee appointed by Am. Inst. Elec. Engrs. and Nat. Elec. Light Assn. is included. The committee suggests two forms for definition of power factor: (1) as ratio of total watts to arithmetical sum of volt-amperes in several phases, each measured to non-inductive neutral point and (2) as ratio of total watts to vector sum of volt-amperes in several phases.

Variations. Variations of Power Factor in Terms of Variations of Active Component (Les Variations du facteur de puissance en fonction des variations de la composante active), P. Rieunier. Revue générale de l'Électricité, vol. 7, nos. 22 and 23, May 29 and June 5, 1920, pp. 715-726 and 755-768, 16 figs. May 29: Formulas and graphs. June 5: Analytical study of general formula.

POWER GENERATION

Coal vs. Water, Norway. Coal or Water (Utenlandske Kul eller norsk Vandkraft som Warmekilde i. vore Boliger), A. Saxegaards. Teknisk Ukeblad, vol. 67, no. 4, Jan. 23, 1920, pp. 49-52. Discussion of whether imported coal or local water power should be used as a source of power generation. Statistics are given applying to Norwegian conditions.

Cost of Gas Engines and Electric Motors. Hydro-Electric Power Pumping in the Oil Fields, R. A. Hopkins. Min. and Oil Bul., vol. 6, no. 2, Jan. 1920, pp. 83-85 and 108, 4 figs. Comparative cost of gas engines and electric motors.

Europe, Progress in. Progress in Power Engineering, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 24, nos. 5 and 6, Mar. 1 and 15, 1920, pp. 268-270 and 321-323. Mar. 1: Analysis of recent developments in Europe based on U. S. consular and commercial reports. Opportunities for American trade are pointed out. Mar. 15: Review of power developments in Asia, Australia and South and Central America during last few years, and possibilities for future expansion.

Gas vs. Electricity. Note on the Thermal Efficiency of the Generation and Use of Gas and Electricity, Dugald Clerk. Gas Jl., vol. 150, no. 2980, June 22, 1920, pp. 778-782. Discussion of figures given as relative thermal efficiencies of gas and electricity in generation, distribution, and use for heat, power, and light, in diagram published in Gas Journal, Feb. 10, 1920, p. 295. According to those figures ultimate efficiency of gas for heating is much greater than that of electricity; for producing motive power, efficiency is greater by gas than by electricity; and for producing light, advantage is in favor of electricity.

New England. Survey of New England Power Situation, Carroll H. Shaw. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 525-527. Analysis of reports received by power section of war industries board indicates total production of more than 5,000,000 kw-hr. by central stations during 1923. Estimated increase of 1,400,000 kw., 1919-1924, inclusive.

Tidal Power. See TIDAL POWER.

Western States. Prospective Power Development in the Far West. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 666-671, 8 figs. Plans for development in Idaho, Montana, Oregon, Washington and California.

World Situation in. Recent Developments in the World's Power Industry, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1002-1005, 3 figs. Digest of reports of United States Consuls on power situation in various parts of world and influence of return of peace.

[See also WATER POWER.]

POWER HOUSES

Foundations. See FOUNDATIONS, Power Houses.

Lighting. See LIGHTING, Power Houses.

POWER PLANTS

Accounting. See ACCOUNTING, Power Plants.

Binary-Vapor. See BOILERS, Mercury.

Connecticut. Connecticut Valley Power Plants. Universal Engr., vol. 32, no. 2, Aug. 1920, pp. 37-47, 24 figs. Development of Turners Falls Power & Electric Company, where more than 75 per cent of power generated during one year ending June 1920 was water power. Other plants described.

Parallel Operation. The Working of Power Stations in Parallel, G. Breght. Elecn., vol. 83, no. 2162, Oct. 24, 1919, pp. 480-481, 2 figs. Methods by which two power stations, supplying power to each other, may adjust their accounts.

Railroad, Stationary. Design and Operation of Railroad Stationary Power Plants. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 368-374. Including discussion of centralization of power and its possibilities. Committee report of Assn. Ry. Elec. Engrs.

[See also POWER HOUSES; STEAM POWER PLANTS.]

POWER TRANSMISSION

Industrial Development. Power Transmission and Industrial Development, Ross J. McClelland. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 825-832, 1 fig. Functions of transmission and power sources sighted from viewpoint of possibility of effecting economies. Writer discusses relationship between power supply and transportation, interconnection of power systems and influence that comprehensive scheme of power supply would have upon national industrial and economic development.

Safety Devices. Safety about Transmission Machinery. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 661-662, 3 figs. Suggestions prepared by Eng. Dept. Nat. Safety Council.

Sonic Waves. Notes on the Sonic Waves (Note sur les ondes soniques), J. Herck. Bul. Technique du Bureau Veritas, vol. 2, no. 4, April 1920, pp. 69-73, 5 figs. Experiments performed and results obtained by George Constantinesco, Roumanian engineer, who, while working for British Admiralty, is said to have developed apparatus which demonstrate that power can be transmitted through a liquid by "sonic" waves, that is, waves behaving remarkably similarly to electrical energy and traveling with speed of sound in liquid. A device for oil injection on Diesel engines is mentioned as one of Mr. Constantinesco's notable applications of sonic waves.

The Transmission of Power by Waves through Liquids. Dorman Wave Power Tools (Catalogue), 68 pp., 32 figs. Appliances originated and designed by W. H. Dorman & Co., Ltd., Stafford, England. British licensees and manufacturers of wave portable, percussion and rotary tools. Wave transmission equipment consists of wave generator, wave motor and wave transmission pipe line. Generator sets up

pressure impulses which travel through column of fluid contained in metal pipe and give up their energy to motor. There is no continuous flow, but fluid progressively moves forward and backward about mean positions. System was invented by George Constantinesco. Tools described are rock drills, tunnelling columns and riveting hammers. System of wave transmission is said to afford large economic and practical advantages over compressed air. Technical explanation of system is appended.

Transmission of Energy by Vibrations of Water in Conduits (Sur la transmission de l'energie par les vibrations le l'eau dans les conduites), C. Camichel. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 11, Sept. 13, 1920, pp. 515-516. Note on Constantinesco system of power transmission by "sonic" waves.

[See also ELECTRIC DRIVE; ELECTRIC POWER; ROPE DRIVE.]

PRECIOUS STONES

Synthetic Production. The Dielectric Constants of Certain Natural and Synthetic Precious Stones (Ueber die Dielektrizitätskonstante einiger natürlicher und synthetischer Edelsteine, mit einem Anhang über Bernstein), Robert Fellinger. Annalen der Physik, vol. 60, no. 2, Oct. 7, 1919, pp. 181-195, 6 figs. Results of experiments undertaken before the war to determine possibility of producing precious stones synthetically. Determination of dielectric constants of rubies, sapphires, topaz, etc., and of amber obtained from North Sea.

PRECIPITATES

Method of Analysis. New Method of Physico-Chemical Analysis of Precipitates. Application to the Study of Calcium Phosphates (Sur une nouvelle méthode d'analyse physico-chimique des précipites. Application à l'étude des phosphates de calcium), Pierre Jolibois. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 24, Dec. 15, 1919, pp. 1161-1163. Utilization of apparatus described in C. R. vol. 169, p. 1095, which permits thorough mixing of two liquids to mixing under uniform conditions of salt solutions susceptible of forming precipitate.

PRECIPITATION

Cottrell Process. The Cottrell Process in Japan, Ritaro Hirota and Kyoshi Shiga. Min. & Sci. Press, vol. 120, no. 7, Feb. 14, 1920, pp. 223-228, 7 figs. Process said to have made comparatively rapid progress. Article briefly describes electrical precipitators installed in Japan up to present time.

Electrical, Bibliography of. Bibliography of Selected Articles on Electrical Precipitation of Suspended Matter. Cement, Mill & Quarry, vol. 16, no. 4, Feb. 20, 1920, p. 18.

[See also FUME, Precipitation of; GASES, Cleaning by Electricity.]

PRESSES

Crankshaft-Straightening. Metalwood Crankshaft-Straightening Presses, J. V. Hunter. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 256-258, 6 figs. Line of hydraulic power presses for straightening automotive crankshafts, developed by Metalwood Manufacturing Co., Detroit, Mich.

Electric Drive. Electric Drive for Presses, Shears, Etc. (Reguliermotoren mit Arbeitsregler für Pressen, Scheren und dergl.), O. Pollok. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 27, July 3, 1920, pp. 500-504, 5 figs. Disadvantages of the hydraulic drive and of flywheels for such machines are discussed, and it is claimed that conditions required of electrically driven machines without flywheels in order that they may replace steam- or air-hydraulic machines, are fulfilled by uses of direct-current shunt motors governed by the device described in paper.

Forging, Automobile Parts. Construction and Operation of Forging Presses for the Manufacture of Automobile Parts (Bau und Betriebsweise von Schmiededepressen zur Herstellung von Automobil-Konstruktionsteilen), Fritz Duesing. Allgemeine Automobil-Zeitung, vol. 21, no. 18, May 1, 1920, pp. 28-30, 14 figs. Describes two methods of manufacturing crankshafts, namely, from flat forged pieces by sawing out, and by forming in dies.

Guard for. A Simple and Effective Press Guard, Leroy W. Allison. Am. Mach., vol. 52, no. 25, June 17, 1920, pp. 1303-1304, 1 fig. Describes guard used in connection with the Sheridan press, consisting of perforated or expanded metal sheets attached to machine both on "operating" and "take-away" sides, permitting operator feeding press to insert leather under guard, and preventing attendant on "take-away" side from removing leather until it protrudes from under guard.

Hydraulic. See FORGING, Hydraulic-Press.

Inclinable. Inclinable Press and Guillotine Shears. Machy. (Lond.), vol. 16, no. 399, May 20, 1920, pp. 206-208, 5 figs. Details of an improved inclinable press capable of cutting blanks up to 2 in. diam. by ½-in. thickness in mild steel, and a 7-ft. by ¼-in. guillotine shearing machine, with body of box section, carried on solid cast-iron legs of great weight, capable of absorbing any vibration machine may be subject to.

Leather-Cutting Tools for. Press Tools for Cutting and Embossing Leather, Paper, etc. (Papierschnitte und Prägewerkzeuge für Leder, Papier u. Dergl.), Heinrich Franz. Werkstattstechnik, vol. 14, no. 4, Feb. 15, 1920, pp. 101-102, 7 figs. Describes arrangement for cutting and embossing paper (especially boxes, pasteboard, etc.) and leather, to replace the various tool-steel dies, punches, etc., made of tool steel commonly used for the purpose.

Safeguarding. Increasing Power Press Safety Without Reducing Production, C. A. Briggs. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 614-616, 8 figs. Devices for increasing safety of power press operation, such as vacuum attachments for removing stock from dies, lever tripping which reduces fatigue and removes hand from contact with dies, etc.

Sub-Presses. Design of Sub-Presses, D. H. Chason. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 841-843, 7 figs. Also Machy. (Lond.), vol. 16, no. 400, May 27, 1920, pp. 235-237, 7 figs. Description of cylinder and pillar types, ways of mounting and method of making pillar-type sub-presses.

Tools for, Design of. An Interesting Press Tool Problem. Eng. Production, vol. 1, no. 6, June 1920, pp. 211-212, 5 figs. Tools designed for production of piece with sharp points.

PRESSURE VESSELS

Bumped-Head, Welded. Stresses Caused by Internal Pressure in Welded Cylindrical Vessels with Bumped Heads (Beanspruchung des Materials geschweisster zylindrischer Druckgefässe für Gase und Flüssigkeiten mit nach aussen gewölbten Böden durch inneren Druck), C. Diegel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 7, Feb. 14, 1920, pp. 157-161, 6 figs. Experiments and formulæ derived from results obtained. It is stated that resistivity of such bumped heads against internal pressure is less than that of a full concave of same curvature radius and same wall strength, and diminishes in proportion to in-

crease in diameter of vessel and decrease in curvature radius of bottom brim.

PRESSWORK

Drawing Square-Cornered Shells. Drawing and Trimming Square-Cornered Shells (Ziehen and Beschneiden viereckiger Hülsen). Werkstattstechnik, vol. 14, no. 1, Jan. 1, 1920, pp. 13-16, 15 figs. Gives instructions for the predetermination of shape and measurements of tools and forms, and describes methods of drawing and trimming shells of square and of rectangular section.

Examples of. A Difficult Piece of Press Work, Frank A. Stanley. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 164-165, 5 figs. Tools required in production of sheet-steel piece of rectangular cross-section tapering from end to end and having numerous ears and flanges at various points along its contour.

Hot Brass Pressings. Hot Brass Pressings, E. Austin. Metal Industry (Lond.), vol. 15, no. 22, Nov. 28, 1919, pp. 445-448, 6 figs. Illustrates samples of hot brass pressing produced on various types of presses.

Seamed Tubular Articles. Cutting, Bending and Closing Operations on Seamed Tubular Articles, A. W. Allen. Machy. (Lond.), vol. 16, no. 413, Aug. 26, 1920, pp. 648-649, 9 figs. Methods of cutting, bending and closing operations used in making seamed tubular articles in punch press.

Tools. Press Tools for a Toothed Cam, Frank A. Stanley. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1075-1077, 8 figs. Tools for blanking, piercing and shaving piece, which is one of nine similar members used in a Marchant calculating machine and constituting as group what is known as a setting drum.

[See also DRAWING.]

PRICES

Lowering. Plain Steps Toward Legitimate Prosperity, E. H. Fish. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 10-12. Suggests as remedy to lower prices to stop turning out luxuries for a while and produce necessities.

PRISMS

Dispersion. The Minimum and Maximum Dispersion and the Chromatic Magnification Difference in the Right Section of a Prism (Das Minimum der Dispersion und die grösste Dispersion sowie die chromatische Vergrösserungsdifferenz im Hauptschnitte eines Prismas), H. Erfle. Zeitschrift für Instrumentenkunde, vol. 39, no. 9, Sept. 1919, pp. 280-288, 1 fig. Formulæ are presented for calculation of dispersion of a beam in the right section of a prism. Results of earlier works on minimum of dispersion.

PROBABILITY

Normal Curve. A Derivation of the Equation of the Normal Probability Curve, W. D. Cairns. Bul. Am. Math. Soc., vol. 26, no. 3, Dec. 1919, pp. 105-108. Method consists in controlling what are termed points of inflection of polygon of symmetrical distribution of magnitudes about their mean, so that these points approach predetermined positions on each side of mean.

Theory of. On Some Aspects of the Theory of Probability, Dorothy Wrinch and Harold Jeffreys. Lond., Edinburgh & Dublin Phil. Mag., vol. 38, no. 228, Dec. 1919, pp. 715-731. Arguments are offered in substantiation of contention that "attempt to give a definition of probability in terms of frequency is unsuccessful." Set of axioms is suggested as basis for mathematical theory of probability.

PRODUCER GAS

Gas from Straw. Recent Experiments with Straw Gas, A. R. Greig. Jl. Eng. Inst. Can., vol. 3, no. 1, Jan. 1920, pp. 10-12, 4 figs. Results of experiments conducted for two winters with process and apparatus developed by Mr. Harrison of Moose Jaw for obtaining a combustible gas from straw.

Improving. See GAS PRODUCERS, Operation.

Tar Extractors. See TAR EXTRACTORS, Wheel Type.

Use by Motor Vehicles. Producer Gas for Motor Vehicles, D. J. Smith. Engineering, vol. 109, nos. 2819 and 2820, Jan. 9 and 16, 1920, pp. 59-64 and 92-95, 9 figs. Also in Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 22-32, 9 figs. Portable gas producer plant designed by writer. Paper read before Instn. of Automobile Engrs.

PRODUCTION

Electricity Supply and Parallel Increase of. Central Station Power as a Factor in Effecting Economies and in Increasing Production, George H. Jones. Jl. Western Soc. Engrs., vol. 25, no. 2, Jan. 20, 1920, pp. 59-65, 4 figs. Diagram is presented showing relative growth in investment and in electricity sold in kw-hr. in years 1900 to 1918, and curve showing increase in number of employees compared with increase in kw-hr. sold.

Increasing. See INDUSTRIAL MANAGEMENT, Production Methods.

[See also INDUSTRIAL MANAGEMENT, Production Control; Production Methods.]

PROFILING MACHINES

See ENGRAVING MACHINES.

PROFIT SHARING

Coöperation and. Coöperation and Profit Sharing. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 117-145. Discussion of aims and possibilities of the Consumers' coöperative movement; Russian coöperative movement; progress of cooperation in various countries, including Denmark, Germany, India, Italy, Netherlands, Norway, Roumania and Sweden; profit sharing and labor copartnership in the United Kingdom.

Form of Payment. A Financier's View of Profit Sharing, Mortimer L. Schiff. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1247-1249. Insists upon a well-grounded understanding, advising inclusion of officers and directors, and gives suggestions in regard to form of payment.

International Harvester Co.'s Plan. Details of Harvester Stock Distribution. Iron Age, vol. 106, no. 10, Sept. 2, 1920, pp. 576-577. Extra compensation and stock ownership plan adopted by stockholders of International Harvester Co. on July 29, to become effective as of Jan. 1, 1920. Arrangement supersedes profit-sharing plan adopted Dec. 23, 1915.

Loss-Sharing Plan. Sharing Losses as well as Profits, Charles N. Winship. Factory, vol. 24, no. 11, June 15, 1920, pp. 1875-1878, 2 figs. Account of a profit-sharing plan, by which profits each year are divided into two equal portions, one of which goes to employees to be shared individually according to their share of annual payroll, but in case of deficit, 50 per cent will be borne by employee-partner.

Plans for. Employment Methods and Profit-Sharing at the Bean Spray Pump Co. Plant. Metal Trades, vol. 10, no. 11, Nov. 1919, pp. 483-486, 1 fig. Principal features are closed non-union shop, premium system, profit-sharing system, and an accounting system that gives em-

ployee quick action in getting his premiums and share of profits.

Reasons for. What May We Expect of Profit Sharing in Industry? Ralph E. Heilman. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 26-27. Writer mentions various business reasons for installing profit-sharing system and points out effectiveness of profit-sharing as efficiency device.

PROFITS

Basis of. On What Should Profits be Based? W. L. Churchill. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 375-380. Writer lays down general principle that profit charge should be just for quality of service rendered. With this in mind he analyzes common methods of "profiting" and finds that they are inconsistent and even dangerous under certain conditions of labor and material costs.

PROJECTILES

Pressure Distribution on Shell Heads. The Pressure Distribution on the Head of a Shell Moving at High Velocities, L. Bairstow, R. H. Fowler, and D. R. Hartree. Proc. Roy. Soc., vol. 97, no. A684, May 1, 1920, pp. 202-218, 4 figs. Experimental. Pressures were measured by using service time fuses as manometers. Preliminary laboratory experiments were performed to determine extent to which rate of burning of a service time fuse was affected by total external pressure on vents.

Shell Flight, Dynamics of. The Dynamics of Shell Flight, R. H. Fowler. Nature, vol. 105, no. 2641, June 10, 1920, pp. 459-461, 2 figs. Survey of researches during war, particularly in regard to accepted theory accounting for drift of shell.

Velocity Measurement. The Measurement of Projectile Velocities, Paul E. Klopsteg and Alfred L. Loomis. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 98-104, 6 figs. Development of "Aberdeen chronograph" adopted as standard by Ordnance Department during war and designed for rapid production. Comparative results as to speed and accuracy of measurement of Aberdeen and Boulangé chronographs are given.

PROPELLERS

Aeroplane. See AEROPLANE PROPELLERS.

Ship. See PROPELLERS, SHIP.

PROPELLERS, SHIP

Blade Repairs. Burning a Tip on to a Propeller Blade. Mech. World, vol. 66, no. 1720, Dec. 19, 1919, pp. 294-295, 6 figs. Illustrates operations required.

Characteristics. Experiments on Full Cargo-Ship Models. Shipbuilding & Shipping Rec., vol. 14, no. 20, Nov. 13, 1919, pp. 556-558, 2 figs. Curves of propeller characteristics. Paper read before Instn. of Naval Architects.

The Propeller (L'helice propulsive), M. Le Besnerais. Bulletin technique du Bureau Veritas, vol. 2, nos. 1, 2 and 3, Jan., Feb. and March 1920, pp. 7-13, 29-32 and 51-54, 9 figs. Various theories explaining operation of propeller are surveyed and method is developed for ascertaining characteristics which must be possessed by a propeller in order to satisfy a given set of conditions. Three marine propellers are considered: Propeller with three elliptical blades, with four elliptical blades and with three wide-tip blades. Examples are given illustrating application of formulæ derived establishing relations between characteristics of a propeller.

Design. Characteristics of a Marine Propeller in a Non-Uniform Stream, T. B. Abell. Engr., vol. 130, no. 3378, Sept. 24, 1920, p. 291, 3 figs. Notes on design of ship propeller.

The Dyson Method of Propeller Design. Shipbuilding and Shipping Rec., vol. 14, no. 25, Dec. 18, 1919, pp. 711-713, 1 fig. Criticism of Dyson's book, "Screw propellers for hydraulic and aerial propulsion."

Thrust and Efficiency of Ship Propellers with Constant Pitch (Schub und Wirkungsgrad der Schiffsschraube mit konstanter Steigung), Felix Langen. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 24, Aug. 30, 1919, pp. 250-251, 3 figs. Formula is derived from Rateau diagram for thrust and efficiency of propeller with constant pitch, taking the friction into account.

Four-Blade vs. Three-Blade. Model Experiments for a Double-Screw Tug Boat of 1400 Hp. (Modeleversuche für einen Doppelschrauben-Schlepper von 1400 PSi), K. Schaffran. Schiffbau, vol. 21, no. 31, June 23, 1920, pp. 851-856, 8 figs. Results of tests to determine influence of number of blades on towing efficiency showed efficiency of 4-blade propellers tested to be 4 per cent higher than that of the 3-blade propellers.

Low-Powered Merchant Ships. Propellers for Low-Powered Merchant Ships, S. M. Robinson. Jl. Am. Soc. Naval Engrs., vol. 32, no. 2, May 1920, pp. 237-241, 2 figs. Also in Shipbuilding and Shipping Rec., vol. 16, no. 7, Aug. 12, 1920, pp. 204-206, 3 figs. Chart is constructed which gives required horsepower for various propeller diameters.

Molding. See MOLDING METHODS, Ship Propellers.

Performance. Estimates of Propeller Performance from Self-Propelled Model Tests, William McEntee. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 417-420, 4 figs. Method developed and used at Washington Model Basin and the comparative results of model tests and ship trials of U. S. S. New Mexico.

Regenerative. Regenerative Propellers. Shipbuilding & Shipping Rec., vol. 15, no. 13, Mar. 25, 1920, pp. 395-396, 3 figs. To utilize twisting motion imparted to water by propeller, another propeller with blades having contrary curvature is held stationary aft of revolving propeller. In Birkett patented device tips of fixed blades are curved with idea of reducing to minimum centrifugal dispersion of screw race, and blades are curved on face somewhat like turbine blades.

Thrust and Efficiency. Calculation of the Thrust and Efficiency of the Screw Propeller (Zur Berechnung des Schubes und Wirkungsgrades von hinter dem Schiff arbeitenden Schrauben), H. Wittmaack. Schiffbau, vol. 21, no. 28 and 29, June 2 and 9, 1920, pp. 763-767 and 794-800, 3 figs. Writer states that through mathematical investigations he has arrived at a new assumption of the working method of these screws which deviates from method widely accepted. Both methods are described.

PROTECTIVE COATINGS

Classification of. See ELECTROPLATING, Military Uses.

Structural Steel. See STRUCTURAL STEEL, Preservative Coatings for.

PUBLIC-COMFORT STATIONS

Reinforced-Concrete. Public Comfort Station for Allentown, Pa., Charles E. Parry. Concrete, vol. 17, no. 3, Sept. 1920, pp. 77-82, 10 figs. Reinforced-concrete construction.

PUBLIC UTILITIES

Accounting. See ACCOUNTING, Public Utilities.

Electric, Financing of. Financing Electric Pub-

lic Utilities, W. F. Gephart. Elec. World, vol. 76, nos. 10 and 11, Sept. 4 and 11, 1920, pp. 471-472 and 516-518. General demand for capital, which is reflected by rise in bond yields, is said to react against regulated business because public utilities cannot quickly change prices to follow upward tendency.

Rate Increases. Increased Costs and Their Retarding Effect on the Public Utility Industry, Edward B. Lee. Nat. Elec. Light Assn. Bul., vol. 7, no. 5, June 1920, pp. 317-322, 6 figs. Gives tables and charts showing how widespread has been effect of great increases in costs. In writer's opinion, it seems certain that we are permanently on decidedly higher level of prices than that prevailing in 1914, and rates of public service must be increased to meet actual conditions or public utilities must stagger and entire country suffer as result.

Stability of Investments. The Stability of Public Utility Investments, Samuel Insull. Elec. Rev. (Chicago), vol. 77, no. 14, Oct. 2, 1920, pp. 514-516. Necessity for communities to safeguard interests, maintain credit and insure stability of public utility companies is emphasized.

State vs. Local Regulation. State Versus Local Regulation of Public Utilities, William J. Hagenah. Elec. Rev. (Chicago), vol. 77, no. 12, Sept. 18, 1920, pp. 435-442. It is claimed that stage regulation is successful, while local or municipal control proves unsatisfactory to utilities and public. Paper presented before Nat. Elec. Light Assn.

Valuation. Valuation of Public Utilities, F. W. Ballard. Jl. Cleveland Eng. Soc., vol. 12, nos. 2 and 3, Sept.-Nov. 1919, pp. 147-154 and (discussion) pp. 154-159. Determination of "fair value" for rate-making purposes.

See also VALUATION, Theory of.

PUBLIC WORKS

National Department of. A National Department of Public Works, M. O. Leighton. Jl. Engrs. Club, Philadelphia, vol. 36, no. 181, Dec. 1919, pp. 472-476. Outline of existing conditions and conflicts of authority in Federal management of Public Works which have led National Engineering Societies to undertake movement for coördination of all such work under Cabinet officer in charge of Dept. of Public Works. Digest of bill now before Congress designed to accomplish this coördination.

The Proposed National Department of Public Works, W. B. Gregory. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 252-254. Need for creation of department.

PULLEYS

Compressed-Spruce. An Investigation of Compressed-Spruce Pulleys, Geo. S. Wilson. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 451-452, 4 figs. Also in Belting & Transmission, vol. 17, no. 7, Oct. 5 1920, pp. 25-27, 2 figs. Comparative tests of cast-iron, steel, wood, paper and compressed-spruce pulleys. Latter pulleys were found to be as serviceable as any of ordinary commercial types.

[See also MACHINE TOOLS, Inertia Effects.]

PULVERIZED COAL

Aero-Pulverizer. The Aero-Pulverizer. Engr., vol. 129, no. 3351, Mar. 19, 1920, pp. 306-307, 3 figs. Machine used by Powdered Fuel Plant Co., Ltd., Westminster, England, which, in one self-contained unit, reduces coal to requisite fineness for burning in furnaces and also feeds it into furnace.

Air-Furnace Firing. See MALLEABLE IRON, Melting.

Application to Boilers. Pulverized Coal for Boilers, Fred A. Scheffler. Stone and Webster Jl., vol. 27, no. 1, July 1920, pp. 28-40. Advantages of pulverized coal, cost of using pulverized coal, and notes on pulverized coal as applied to boilers.

Blast Furnaces, Use in. Application of Pulverised Coal in Blast Furnaces, E. P. Mathewson and W. L. Wotherspoon. Engineering, vol. 108, nos. 2812 and 2814, Nov. 21 and Dec. 5, 1919, pp. 695-697 and 749-751, 25 figs. Experiments at various plants. It is concluded that experiments have given results sufficiently encouraging although not as yet fully satisfactory.

Progress in Powdered Coal for Blast Furnaces, W. L. Wotherspoon. Eng. & Min. Jl., vol. 109, no. 14, Apr. 3, 1920, pp. 803-804, 4 figs. States that Midvale lead smelter is using system and other companies are interested. Describes new safety vortex tuyere being developed.

Boiler Firing. Powdered Coal as a Fuel for Boiler, Edward R. Welles and W. H. Jacobi. Stevens Indicator, vol. 37, no. 2, April 1920, pp. 97-125, 10 figs. Advantages of pulverized coal over lump coal are enumerated and comparative cost figures of burning coal in these two forms are presented. Burners and furnaces for pulverized coal are described.

Pulverised Coal in the Power Station, L. G. Harvey and E. E. Noble. Elecn., vol. 85, no. 2209, Sept. 17, 1920, pp. 320-323, 4 figs. States that old fears so long held that pulverized coal as fuel for boilers is unreliable and dangerous can be laid to rest. Notes on machinery and equipment required; suitable fuels; pulverized coal versus low-temperature carbonization; transportation of fuel; water tube and Lancashire boilers; mechanical stokers and economizers for Lancashire boilers, etc.

Brass-Foundries. Pulverized Coal in the Brass Foundry, L. C. Harvey. Metal Industry, vol. 15, no. 12, Sept. 19, pp. 224-227, 4 figs. Suggested type of furnace for powdered coal firing.

Burners. Powdered Fuel for Chemical Plants, H. D. Savage. Combustion, vol. 3, no. 4, Oct. 1920, pp. 32-33, 1 fig. "Lopulco" feeder and metallurgical burner.

Pulverized Coal (Charbon pulvérisé), Hugh Savage. Revue Universelle des Mines, vol. 6, no. 1, July 1, 1920, pp. 5-48, 17 figs. Modern furnaces and burners for burning pulverized coal, including types used in locomotives.

The New Lakeside Pulverized-Coal Plant, Milwaukee. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 358-360, 1 fig. Ultimate capacity to be 200,000 kw. Initial installation of 40,000 kw. Features are long, low, bungalow type of building, special coal handling and preparation equipment, burners of horizontal and vertical types and 500-kw. turbo-generator to supply current for station auxiliaries which will exhaust to feedwater heaters and by thermostatic regulation maintain temperature of feedwater.

Canadian Plant. Waterford Lake Power Plant of the Dominion Coal Co., Frank H. Kneeland. Coal Age, vol. 17, no. 8, Feb. 19, 1920, pp. 354-355. Coal-mine power plant where powdered coal is burned under Bettington boilers.

Canadian Report on. The General Fuel Situation in Canada. Power House, vol. 13, no. 4, Feb. 20, 1920, pp. 76-77. Abstract of report of Commission of Conservation, Ottawa, on pulverized coal.

Central Stations. Pulverized Coal in Central Stations, John Anderson. Elec. World, vol. 75, no. 11, Mar. 13, 1920, pp. 589-591, 2 figs. In

tests conducted by engineers of Milwaukee Elec. Ry. & Light Co. efficiency of 80 per cent is said to have been obtained for pulverized-fuel installation.

Combustion. Pulverization and Gasification of Coal (Charbon pulvérisé et gazogène), G. Marconnet. Chaleur & Industrie, no. 3, May 1920, pp. 132-135, 3 figs. Technique of burning powdered or gasified coal.

Science of Powdered Fuel Combustion, Joseph F. Shadgen. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 457-461. Thermic fundamentals. Effects of various air quantities on temperature and gases produced. Ash problem. Burner essentials.

Comparison with Stokers. Pulverized Coal Versus Stokers for Boilers. Iron Age, vol. 105, no. 26, June 24, 1920, pp. 1798-1800. Comparison of equipment and operating costs. Factors to be considered in converting existing plant.

Cost. Powdered Coal Winning Out in Special Fields, Charles Longenecker. Coal Trade Jl., vol. 51, no. 13, March 31, 1920, pp. 353-355, 4 figs. Table is given showing comparative cost of powdered coal with other fuels.

Powdered Coal, J. E. Muhlfeld. Proc. Engrs. Soc. Western Pa., vol. 36, no. 4, May 1920, pp. 243-262 and (discussion) 263-273. General and specific data on the cost and use of powdered coal.

Pulverized Coal in the Power Station, L. C. Harvey and E. E. Noble. Elecn., vol. 85, no. 2211, Oct. 1, 1920, pp. 393-396, 1 fig. Comparative cost figures for hand and pulverized coal firing of boilers.

Cost of Preparation. Pulverized Coal for Stationary Boilers, H. F. Barnhurst. Combustion, vol. 2, no. 5, May 1920, pp. 18-20, 2 figs. It is pointed out that pulverized coal should be dried before it is used, and thus uniform temperature conditions can be maintained in furnace. Cost of preparing coal compares favorably, it is said, with handling cost of stokers in medium-size installations, and in larger installations cost of investment and of preparation is considerably less than that required for up-to-date stoker installations and their operation; and flexibility of operation is said to be equal to that of oil or natural gas.

Distributing Systems. Pulverized Coal Distributing Systems, Joseph F. Shadgen. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1423-1426. Coal powder and its characteristics. Storage and feeding devices. Pneumatic transportation by suspension, pressure and emulsion methods.

Distribution to Small Plants. Distributing Pulverized Coal to Small Plants, B. J. Cross. Coal Age, vol. 17, no. 14, April 1, 1920, pp. 635-637, 5 figs. It is stated that using pulverized coal from central plant is becoming general practice in West. It is emphasized that pulverized sub-bituminous coal must be kept dry and air so far as possible excluded if fuel is to be handled safely.

Economy of. Forecasting the Fuel of the Future, V. Z. Caracristi. Chem. Age, vol. 2, no. 2, Feb. 1920, pp. 361-365, 2 figs. Economies of burning coal, pulverized and in suspension, are pointed out.

Operating by Powdered Coal to Save Fuel, A. C. Cole. Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 417-418. Gives the operation of a powdered coal plant and demonstrates the possibility of reducing cost of operation by its use as a fuel; includes a description of equipment.

Efficiency of. Powdered Coal Efficiencies, H. D. Savage. Gas Age, vol. 45, no. 12, June 25, 1920, pp. 541-543. Results of tests on steam coals are said to indicate wide variety of low-grade coals that are available and thoroughly practical for power generation when used in pulverized form. Address before Nat. Elec. Light Assn,

Equipment for Using. Powdered Fuel and Its Equipment. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1006-1009, 5 figs. Methods of preparation and handling; types of pulverizers.

Equipment, Test of. Test of Pulverized Fuel Equipment, John Anderson. Combustion, vol. 3, no. 1, July 1920, pp. 17-21, 1 fig. Tabulated results obtained in tests performed at Oneida Street plant of Milwaukee Elec. Ry. & Light Co.

Explosive Hazard. Explosive Hazard of Pulverized Coals in Steel Mills, L. D. Tracy. Cement, Mill and Quarry, vol. 16, no. 2, Jan. 20, 1920, pp. 19-21. Investigations by Bureau of Mines.

Fineness Factor. Status of the Powdered Fuel Problem, Joseph F. Shadgen. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 32-34. Plea for establishing factor of fineness.

Future of. Future Developments in the Use of Fuel, H. Kreisinger. Coal Age, vol. 16, no. 21, Nov. 27 and Dec. 4, 1919, pp. 829-832, 5 figs. Also Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 579-582. Possibilities of powdered coal, colloidal fuel and carbocoal. Paper read before Coal Min. Inst. of America.

Holbeck Scheme of Burning. Utilization of Pulverized Coal (L'emploi du charbon pulvérisé), M. Reveillac. Bulletin et comptes rendus mensuels de la Société de l'Industrie Minérale, vol. 16, no. 4, 1919, pp. 347-365, 2 figs. Economical aspect of burning pulverized coal is discussed and reference is made by way of illustration to Holbrook scheme for burning pulverized coal.

Installations. Pulverized Coal Under Central-Station Boilers, John Anderson. Power, vol. 51, no. 9, Mar. 2, 1920, pp. 336-339, 3 figs. Discusses equipment required, method of applying and facts concerning operation. Chief merits of powdered coal are said to be high efficiency and flexibility to meet varying demands.

Pulverized Fuel at Oneida Street Plant, Paul W. Thompson. Power, vol. 51, no. 9, Mar. 2, 1920, pp. 339-340. Description of installations on 468-hp. boilers in power plant of Milwaukee Elec. Ry. & Light Co., which, it is claimed, proved to be entirely successful, and boiler-room operation is much simpler than with stoker installation. Address presented before Technical League of Employes Mutual Benefit Assn.

Locomotives. Pulverized Coal Burning Equipment for Europe. Ry. Mech. Engr., vol. 94, no. 9, Sept. 1920, pp. 581-582. Description of locomotives recently designed to utilize low-grade coals in Italy and Holland.

Melting Iron with. Melting Iron with Powdered Coal. Iron Trade Rev., vol. 66, no. 9, Feb. 26, 1920, pp. 627-630, 4 figs. Installation of unloading, crushing, drying, conveying and burning system for using pulverized coal in malleable air furnace. Equipment manufactured under patents held by Combustion Economy Corp.

Metallurgical Furnaces. Pulverized Coal in Metallurgical Furnaces at High Altitudes, Otis L. McIntyre. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 225-227, 4 figs. Preliminary experiments with pulverized coal which led to installation of apparatus for its use in blast furnaces, reverberatories and sintering machines of Cerro de Pasco Copper Corporation at La Fun-

dicion, Peru, works situated at an elevation of 14,000 ft.

Milwaukee Plant Equipment. Pulverized Coal in a Milwaukee Power Plant. Elec. Rev. (Chicago), vol. 76, no. 12, Mar. 20, 1920, pp. 469-472, 5 figs. Plant layout, methods and special features of Oneida Street station of Milwaukee Elec. Ry. & Light Co. Details of equipment and sizes of motors used. Data on operating experiences.

Plants. Modern Coal-Pulverizing Plant at the United Verde, J. B. Johnson. Eng. and Min. Jl., vol. 110, no. 8, Aug. 21, 1920, pp. 358-360, 6 figs. Jeffrey breakers followed by Ruggles Coles driers and Raymond pulverizers. Powdered coal carried to smelter bins by screw conveyors and blown to drier burners with 40-lb. air. 750-ton plant erected at cost of $725,000.

Powdered Coal Firing for Metallurgical Furnaces and Steam Boilers, J. S. Atkinson. Jl. of West of Scotland Iron & Steel Inst., vol. 27, parts 4 and 5, Jan.-Feb., session 1919-1920, pp. 44-49 and 58-60 and (discussion) pp. 49-57, 6 figs. Deals with plants put down and in course of construction, and experiments carried out in England and elsewhere and discusses the two considerations which are said to count most heavily with engineers against powdered coal, namely, composition and disposition of ashes, and fear of explosions.

United States Nitrate Plant No. 2, J. B. Gaffney. Cement, Mill & Quarry, vol. 16, no. 8, April 20, 1920, pp. 15-20, 8 figs. Pulverized coal plant and rotary kiln lime plant which it served as part of ammonium nitrate plant built by Air Nitrates Corporation, Muscle Shoals, Ala.

Preparation. Methods of Preparing Pulverized Coal, Joseph F. Shadgen. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 389-392. Descriptions of devices for crushing, pulverizing, drying, handling, cleaning, weighing and ventilating.

Railway Power Plants. Pulverized Fuel for Peak-Load Service in Railway Power Plants, O. M. Rau. Power, vol. 52, no. 4, July 27, 1920, pp. 140-141. Experience of Philadelphia Rapid Transit Co.

Rolling Mills. See ROLLING MILLS, Pulverized Coal for.

Steel Plants. Burning Pulverized Coal in a Sheet Mill. Iron Age, vol. 104, no. 24, Dec. 11, 1919, pp. 1167-1172, 14 figs. Details of installation at rolling mills.

Pulverized Coal in Open-Hearth Practice, W. H. Fitch. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1323-1328. Review of experience of eighteen American steel plants.

Tests. Pulverized Coal and Colloidal Oil on Board Ship, L. C. Harvey. Shipbuilder, vol. 21, no. 111, Nov. 1919, pp. 263-269, 4 figs. Data on fixative and on pulverized coal tests carried out on U. S. Patrol Gem.

Uses. Pulverized Fuel, E. R. Knowles. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 17-72, 38 figs. Illustrates typical applications of pulverized fuel to heating furnace with waste-heat boiler, to open-hearth furnaces, and arrangement of plant for pulverizing coal. Advantages and disadvantages of pulverized coal as fuel are discussed and figures are presented giving costs of coal-pulverizing plants and cost of pulverizing coal per ton.

PUMPING

Acids. See ACIDS, Pumping.

Electric, California. The Permanence of Electric Pumping in California, Charles H. Lee. Jl. Electricity, vol. 44, no. 4, Feb. 15, 1920, pp. 161-163, 3 figs. Cautions against undertaking new enterprises of electric pumping without first becoming assured of permanency of underground water supply.

Gasoline vs. Electricity. Comparison of Gasoline and Electric Pumping, H. R. Turner. Public Works, vol. 48, no. 14, Apr. 17, 1920, pp. 322-324, 3 figs. Pump at water works of Windsor, Conn., it is said, is operated by electricity 20 per cent more economically than by gasoline.

Principles of. The Pumping of Air and Water, F. C. Lea. Colliery Guardian, vol. 119, no. 3099, May 21, 1920, pp. 1427-1429, 9 figs. Writer illustrates developments that have taken place through centuries in direction of mechanical appliances for lifting fluids, and discusses certain points and principles that should be kept in mind by designers and users alike. Notes on the hydraulic ram, jet pumps, the Humphrey pump, reciprocating vs. centrifugal pumps, etc. Paper read before S. Staffordshire & Warwickshire Inst. Min. Engrs., slightly abridged.

PUMPING ENGINES

Unaflow. Further Tests of Unaflow Pumping Engine, D. A. Decrow. Can. Engr., vol. 39, no. 14, Sept. 30, 1920, pp. 396-397. Tests conducted at Water Works Pumping Station of City of Buffalo. It is concluded that permissible speeds of this type of pumping engine are much higher than considered advisable for familiar types of crank and flywheel pumping engines. Also higher steam economy was obtained at higher speeds and temperatures. Paper read before New England Water Works Assn.

Tests of the Unaflow Pumping Engine, D. A. Decrow. Jl. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 535-543 and (discussion) pp. 543-544, 4 figs. Set of indicator cards from condensing engine are shown and discussed.

The Unaflow Pumping Engine, D. A. Decrow. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 518-523, 2 figs. Derives its name from fact that steam travels over path into and through steam cylinder in one direction. Application of unaflow principle to reciprocating pumping engine is explained.

PUMPING PLANTS

Diesel-Engined. The Power Plant of the Appleton, Wis., Water-Works, James Otrady and Edward E. Sager. Am. City, City Edition, vol. 22, no. 1, Jan. 1920, pp. 55-57, 4 figs. Power plant consists of two 225-b-hp. Diesel engines which are direct-connected to four 2,000,000-gal. double-acting triplex pumps.

Motor-Driven Centrifugal. A 13-Million Gallon Motor Driven Centrifugal Pumping Plant, Design, Selection of Equipment, Tests, Fred C. Wyse. Proc. Tri-State Water & Light Assn. of Carolinas & Georgia, June 17 and 18, 1919, pp. 33-37. Modification of plant in order to reduce high cost due to low duty of pump engines.

[See also SEWAGE PUMPING, Pumping Plants.]

PUMPING STATIONS

Diesel-Engined. The Power Plant of the Appleton, Wis., Water Works, James Otrady and Edward E. Tager. Am. City, Town and Country Edition, vol. 22, no. 1, Jan. 1920, pp. 55-57, 4 figs. Plant consists of two 225 b-hp. Diesel engines which are direct-connected to four 2,000,000-gal. double-acting triplex pumps, one at each engine shaft.

Electrically Operated. Five Thousand Horse Power Electrically Operated Pumping Plant, E. Bachman and W. J. Delehanty. Gen. Elec.

Rev., vol. 23, no. 8, Aug. 1920, pp. 684-687, 5 figs. Plant has total capacity of 676,000,000 gal. of water per day.

Foundations. Difficulties in Building the Louisville Pumping Station, James B. Wilson. Jl. Am. Water Works Assn., vol. 7, no. 5, Sept. 1920, pp. 663-671, 3 figs. Rock was so far below surface of river that founding upon it would have been impossible except by very difficult and expensive operation. Design of foundations adopted was caisson 90 feet square with bay on river side 22 feet by 51 feet in plan and total depth of 33 feet in outside vertical dimensions. Sixteen octagonal dredging wells were placed in main body and 2 rectangular wells in river bay.

Italy. The Pumping Plant of the Viverone Hydraulic Storage Plant (Die Pumpen-Anlage des hydraulischen Kraftakkumulierungswerkes Viverone), G. Müller. Schweizerische Bauzeitung, vol. 76, nos. 12 and 13, Sept. 18 and 25, 1920, pp. 129-132 and 143-146, 17 figs. Description of largest existing storage plant completed in 1913 and serving exclusively for storage purposes—regulation and equalization of energy for the numerous hydraulic power installations of the Società Anonima Elettricità Alta Italia. Details of Sulzer 4500-hp. high-pressure pumps running at 735 r.p.m., etc.

Toledo, Ohio. Revamping Toledo Pumping Station Under Service, George N. Schoonmaker. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1184-1186, 3 figs. Six hydraulically-operated valves manipulated from table in pumping station control central header system.

PUMPS

Air. See AIR PUMPS.

Air-Lift. Experiences with Air Lift Pumps, W. G. Kirchoffer. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 177-184, 5 figs. Out of comparative tests in which gals. per min. pumped and submergences were equal for each nozzle, 40 per cent are reported to have resulted in favor of straight nozzle by average of 0.024444 cu. ft. of air per gal.

St. Louis Tunnels Unwatered by Air Lift, Edward E. Wall. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 857-859, 12 figs. Installation of two-stage air lift with capacity of 3000-4000 gal. per min. and maximum head of 76 ft. It is said that difficulties were experienced with other types of pumps.

Unwatering by Air Lift in Grass Valley, California, George J. Young. Eng. & Min. Jl., vol. 110, no. 2, July 10, 1920, pp. 63-65, 4 figs. Idaho-Maryland property successfully opened up to the 1000-ft. level by air lifts and pumps. Details of installing lift pipes in old shaft and practical operating suggestions.

Boiler-Feed. The Operating Costs of Boiler-Feed Pumps (Die verschiedenen Speisepumpen für Dampfkessel und die Betriebsunkosten dieser Pumpen), B. Mitusch. Fördertechnik u. Frachtverkehr, vol. 13, no. 1, Jan. 9, 1920, pp. 1-2. Gives relative operating costs of belt-driven, electrically-driven, steam flywheel, and duplex steam pumps, of which the first is shown to be the most economical.

Calculations. Pump Calculations, H. M. Brayton. Southern Engr., vol. 32, no. 5, Jan. 1920, pp. 70-73, 2 figs. Manner of drawing charts for determining power requirements of boiler-feed pumps and pumps for general power-plant purposes.

Centrifugal. See PUMPS, CENTRIFUGAL.

Corrosive-Liquid. Pumps for Corrosive Liquids. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 253-254, 6 figs. Made of modified form of ceratherm, said to have higher tensile strength and to possess further advantage of being more easily manufactured to accurate dimensions.

Electrically Operated. Observations on Electrically Operated Pumps in Indiana, G. C. Blalock. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 184-187, 5 figs. Also in Eng. World, vol. 16, no. 4, Feb. 15, 1920, pp. 193-195, 4 figs. Forms and types of cells and methods of pumping water employed. Paper read before Indiana Eng. Society.

Explosion. See IRRIGATION, Pumps.

Fire. Fire Pumps, Charles L. Hubbard. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1047-1051, 12 figs. Various types, their construction and methods of driving.

Heat. See HEAT PUMPS.

Mercury, Oberhoffer High-Vacuum. Automatic High-Vacuum Mercury Pumps with Provision for Preservation of the Exhausted Gases (Automatische Quecksilberpumpe für hohes Vakuum mit Auffangvorrichtung für die ausgepumpten Gase), A. Beutell and P. Oberhoffer. Chemiker-Zeitung, vol. 43, no. 125, Oct. 16, 1919, pp. 705-706, 3 figs. Description of a modified Oberhoffer pump designed specially for investigation of gases occluded in metals and minerals.

Oil. See OIL PUMPS.

Quarry. Pumps in Quarry Service. Stone, vol. 40, no. 9, Sept. 1919, pp. 405-407. Pumping equipment at quarries of company in Carthage, Miss., where quantity of 50,000 gallons of water per day is used.

Rotary. A New Type of Pump (Un nuovo tipo di pompa). Industria Meccanica, vol. 2, no. 7, July 1920, pp. 217-218, 5 figs. Novel type of rotary pump manufactured by the Officine Meccaniche Gallaratesi-Gallarate.

See also Squeegee Rotary.

Salvage. Turbine-Driven Salvage and Bilge Pump. Shipbuilding & Shipping Rec., vol. 14, no. 20, Nov. 13, 1919, pp. 553-555, 6 figs.; also Steamship, vol. 31, no. 366, Dec. 1919, pp. 143-146, 7 figs. Pump is direct-driven and of centrifugal type. It is mounted on tank top or inner bottom of vessel, drawing direct from bilge through removable strainer and delivering through connection passing through bottom to under side of vessel.

Self-Measuring. Improved Self-Measuring Pumps, A. W. Macleod. Petroleum World, vol. 16, no. 231, Dec. 1919, pp. 504-508, 4 figs. Invention relating to measuring device of pumps designed to discharge measured quantities of oil per each full stroke or per portion of stroke.

Squeegee Rotary. The Squeegee Rotary Pump. Engineering, vol. 108, no. 2805, Oct. 3, 1919, p. 455, 4 figs. Pump consists of six main parts—casing, two covers, shaft and two rotors, which, in standard design, are covered with india rubber.

Submersible. A Submersible Electrically Driven Pump. Elecn., vol. 83, no. 2164, Nov. 7, 1919, p. 535, 2 figs. Operated by d. c. motor which is enclosed in cylinder chamber made of boiler plate and riveted and lagged on inside with cork cement to reduce condensation, thus protecting brush gear and windings.

See also PUMPS, CENTRIFUGAL, Submersible.

Turbine, Prime Movers for. See WATER SUPPLY, Turbine Pumps.

Vacuum. Reversing the Air Compressor to Reduce Cost of Living, Robert G. Skerrett. Compressed Air Mag., vol. 25, no. 10, Oct. 1920, pp. 9813-9819, 14 figs. Harrison process for dehydration of foodstuffs.

The Production and Measurement of High Vacua. Part II. Methods for the Produc-

tion of Low Pressures,, Saul Dushman. Gen. Elec. Rev., vol. 23, no. 7, July 1920, pp. 605-614, 17 figs. Types of pumps that have been developed for production of high vacua.

See also Mercury.

PUMPS, CENTRIFUGAL

Electrically Driven. Motor-Driven Pumps Develop High Efficiency. Elec. Rev. (Chicago), vol. 76, no. 16, Apr. 17, 1920, pp. 635-637, 4 figs. Tests on centrifugal pumps direct-connected to synchronous motors.

The Economy Resulting from the Use of Variable Speed Induction Motors for Driving Centrifugal Pumps, Melvin L. Enger and Wm. J. Putnam. Jl. Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 536-541, 3 figs. Also in Mun. and County Engineering, vol. 59, no. 2, Aug. 1920, pp. 69-72, 3 figs. Writers state that variable speed induction motor is more expensive than ordinary type but saving in power will much more than pay interest and depreciation on additional investment.

Hydraulic Drive. A Centrifugal Bilge Pump with Water-Motor Drive (Eine durch Druckwasser betriebene Kreiselpumpe zum Lenzen), F. Lawaczeck. Fördertechnik u. Frachtverkehr, vol. 13, nos. 14 and 15, July 9 and 23, 1920, pp. 125-127 and 135-137, 7 figs. Discussion of practical results, efficiency and speed of new type of portable pump operated by water pressure.

Impellers. Researches on the Theory of the Action of Centrifugal Pump Impellers, Otogorô Miyagi. Technology Reports of the Tôhoku Imperial University, Sendai, Japan, vol. 1, no. 1, 100 pp., 24 figs. Mathematical study.

Parallel Operation. Parallel Discharge of Centrifugal Pumps, T. M. Heermans. Power, vol. 51, no. 14, Apr. 6, 1920, pp. 554-555, 4 figs. States that to operate successfully in parallel, centrifugal pumps should have steep head-capacity curves and slope of curves should be about the same.

Rees Roturbo. The Principles of a New Centrifugal Pump, J. H. Moore. Power House, vol. 12, no. 19, Nov. 20, 1919, pp. 513-518, 10 figs. Rees-Ro-Turbo type, which comprises single or series of pressure drums—number depending on nature of work—rotating inside cast-iron casing at moderately high speed. When running water gravitates or is drawn into eye of revolving pressure drum where its speed, being slow relative thereto, water is carried round by revolving partitions.

Submersible. Submersible Pumps. Engineer, vol. 128, no. 3337, Dec. 12, 1919, p. 595, 3 figs. Motor is enclosed in water-tight cylindrical casing of boiler plate and is directly coupled to centrifugal pump.

Submersible Electric Motor Pump, T. L. Reed Cooper. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 274-275, 5 figs. Suction connection is formed in other end cover and water passes in longitudinal direction through helical passages in rotor to impeller. Stator windings and laminations are contained in closed annular chamber practically filled with transformer oil. Pump comprises three-phase induction motor having squirrel-cage rotor to one end of which pump impeller is attached while volute chamber and delivery connection are formed in other end cover.

Tests. High-Pressure Centrifugal Pumps (Les pompes centrifuges à hautes pression), Ch. Hanocg. Revue universelle des Mines, vol. 6, no. 3, Aug. 1, 1920, pp. 169-201, 37 figs. partly on 3 supp. plates. Tests made at Laboratory of Applied Mechanics and Industrial Physics, Liège University.

Water-Works. A Remarkable Pumping Performance at the Northeast Pumping Station, Minneapolis, F. W. Cappelen. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 88-101. Specifications for electric-motor-driven centrifugal pump designed to deliver 30,000,000 gal. of water in 24 hours against average dynamic head of 250 ft.

Motor Driven Centrifugal Pumps at Quincy, Ill., W. R. Gelston. Public Works, vol. 48, no. 22, June 12, 1920, pp. 504-507, 1 fig. Both low-lift and high-lift pumps and booster pumps are driven by electricity. Water Department finds these pumps "economical and very reliable and satisfactory," and it is said that reserve steam equipment is seldom used.

The Use of Centrifugal Pumps in Municipal Water Plants, Russell A. Murdoch. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 253-255 and p. 258, 3 figs. Performance curve of centrifugal pump operating against constant head.

PUNCHES

Heat Treatment. Heat Treatment of Alternate Contact Tools, John J. Jones. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 171-176. Concerning use of pyrometers, economical management of heat-treating plant and manner of treating such tools as punches, dies and pneumatic hammer pistons.

PUNCHING

High-Speed, Laws of. The Laws of High-speed Punching. Engr., vol. 130, no. 3371, Aug. 6, 1920, pp. 126-127. Discussion of paper with above title issued by War Office from the Ordnance Committee Press, which submits, with experimental proof of its soundness, a novel theory called "the seriatim theory of high-speed punching," from which theory a new law of dynamics is deduced.

Materials Best Suited to. Punching Practice (Aus der Stanzerei-Praxis). Metall-Technik, vol. 45, no. 49-50, Dec. 18, 1919, pp. 193-194. It is pointed out that the softest material is not necessarily most suitable for punching purposes, but material possessing greatest tensile strength and firmness. Gives table showing tensile strength of various metals and alloys.

PUNCHING MACHINES

Safety Devices for. Various Examples of Efficient Safeguarding, A. L. Keams. Can. Machy., vol. 24, no. 12, Sept. 16, 1920, pp. 260-262, 8 figs. Safety devices for punching presses.

PURCHASING

See INDUSTRIAL MANAGEMENT, Purchasing Methods.

PYRIDINE

Recovery of. Recovery of Pyridine from By-product Coke Ovens, F. E. Dodge and F. H. Rhodes. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 274-275, 1 fig. Diagrammatic method of separation.

PYRITES

Production in 1919. See MAGNESITE, Production in 1919.

PYROMETERS

Automatic Regulating. Automatic Regulation of Temperature in Gas Heating Apparatus (Selbsttätige Temperaturregelung der Gasfeuerstätten), H. Fink. Werkstattstechnik, vol. 14, no. 2, Jan. 15, 1920, pp. 44-47, 12 figs. Automatic regulating pyrometer designed by author for use in furnaces, ovens, etc.

Brass Foundry. Measurement of Casting Tem-

peratures in the Brass Foundry, John Arnott. Foundry Trade Jl., vol. 22, no. 225, Sept. 1920, pp. 688-690. Details of temperature-measuring instruments, including thermocouples, resistance pyrometers, radiation pyrometers, and optical pyrometers. Writer enumerates characteristics which a pyrometer should have to be of real service in foundry. Paper read before Instn. British Foundrymen.

Manipulation. Melting Point Methods at High Temperatures, Leo I. Dana and Paul D. Foote. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 186-217, 25 figs. Notes on use of thermoelectric pyrometers, resistance thermometers, optical pyrometers, and other methods.

Optical. Calibration of an Optical Pyrometer, W. E. Forsythe. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920, pp. 1211-1213, 1 fig. Reliability of various methods of calibration.

The Disappearing Filament Type of Optical Pyrometer, W. E. Forsythe. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 21-50 and (discussion) pp. 50-53, 12 figs. on supp. plates. Writer discusses fully the different principles that have to do with accuracy and use of type known as Morse or Holborn-Kurlbaum pyrometer, and gives results of several experiments and reasons for its extensive use in industrial work.

Radiation. Investigation of Two Radiation Pyrometers (Untersuchung zweier Strahlungspyrometer), G. Berndt. Dinglers Polytechnisches Jl., vol. 334, nos. 24 and 25, Nov. 29 and Dec. 13, 1919, pp. 269-274 and 281-286, 5 figs. Details and comparison of Féry and Braun pyrometers. The main advantage of radiation over optical pyrometers is said to be that former permit of registration of temperature and remote observation; but writer claims there are a number of disadvantages in the Féry and Braun instruments, which he discusses separately. Report from physical laboratory of the C. P. Goerz Co.

Steel Manufacture. The Use of the Pyrometer in Steel Industry, R. P. Brown. Can. Machy., vol. 22, no. 26, Dec. 25, 1919, pp. 620-622. Also in Can. Foundryman, vol. 11, no. 9, Sept. 1920, pp. 227-229. Progress made in accurate measurement and control of high temperatures in heat treatment of steel.

Thermoelectric. Thermo-Electric Pyrometry, J. F. Springer. Brass World, vol. 16, no. 6, June 1920, pp. 155-157, 6 figs. Consideration of the latest practice and apparatus, with illustrations of instruments developed by the Brown Instrument Co.

Types. Pyrometry in the Steel Industry, Richard P. Brown. Jl. Am. Steel Treaters Soc., vol. 2, Nov. 1919, pp. 51-64 and (discussion) pp. 65-67, 8 figs. Illustrating various types and forms.

Types and Uses. Melting Point Methods at High Temperatures, Leo I. Danna and Paul D. Foote. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 63-70, 13 figs. Illustrates uses of thermoelectric, resistance and optical pyrometers and discusses relative value of these instruments.

[See also FORGING, Pyrometer Uses in; HEAT METERS.]

PYROMETRY

Potentiometers. See POTENTIOMETERS, Uses in Pyrometry.

Q

QUARRIES

Equipment. An Illinois Stone Quarry Specializes in Production of Agricultural Limestone. Rock Products, vol. 22, no. 22, Oct. 25, 1919, pp. 16-18, 9 figs. Equipment of plant which produces 15 carloads per day.

Tracks. See STEAM SHOVELS, Quarry Tracks.

[See also PUMPS, Quarry.]

QUARRYING

Electric Locomotives in. Large Canadian Quarry Operation with Electric Trolley Locomotives. Rock Products, vol. 22, no. 23, Nov. 8, 1919, pp. 20-23, 13 figs. Single track from plant is divided at quarry entrance into two tracks one of which is permanent while other is temporary loading track. It is said track gang of six men can readily shift pole line in two hours.

Portland Cement Rock. Producing Raw Materials for Portland Cement, Oliver Bowles. Cement, Mill & Quarry, vol. 16, nos. 1, 7 and 9, Jan. 5, Apr. 5 and May 5, 1920, pp. 11-16, 13-19 and 15-20, 20 figs. Jan. 5: Methods and equipment used in stripping of overburden. Apr. 5: Notes on detonating fuse. Discusses method and precautions to be taken in using fuse and relative cost of fuse and detonations. Gives table of rate of detonation of trinitrotoluene detonating fuse and certain samples of high pressure, and examples of shots in which detonating fuse was employed. May 5: Notes on mining rock for cement manufacture.

Well-Drill Blasting. Well Drill Blasting in Southern Quarries, H. H. Hamilton. Rock Products, vol. 22, no. 26, Dec. 20, 1919, pp. 17-18. Observations in regard to placing and depth of holes, charging, etc.

QUARTZ CRYSTALS

Optical Purity. Method for Examining the Optical Purity of Quartz Crystals (Méthode pour examiner la pureté optique des cristaux de quartz), H. Buisson. Jl. de Physique Théorique et Appliquée, vol. 8, Jan. 1919, pp. 25-31, 9 figs. Uses for luminous source a vacuum mercury arc.

QUASI-ARC WELDING

See ELECTRIC WELDING, ARC, Quasi-Arc Process.

QUAY WALLS

Design. Special Quay Wall for Shores which Require Filling. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 658-659, 4 figs. Precast concrete piles form face wall with precast concrete ties to hold them against shore fill.

New Type. A New Economical Type of Quay Wall (Nuovi tipi economici per muri di calata). Ingegneria Italiana, vol. 6, no. 142, Oct. 7, 1920, pp. 109-111, 7 figs. Rubble base upon which two walls of cellular blocks are raised, space between them being filled with broken stone and concrete.

Reinforced-Concrete. Reinforced-Concrete Sheet Piling for Quay Walls (Murs de quai en pieux-palplanches en béton armé), Ch. Dantin. Génie Civil, vol. 76, no. 19, May 8, 1920, pp. 425-427, 8 figs. Construction at Kenitra, Morocco.

QUICKLIME

See LIME, Milk of.

QUICKSAND

Nature and Control. Quicksand: Its Nature, Behavior and Control, Charles R. Gow. Can. Engr., vol. 39, no. 14, Sept. 30, 1920, pp. 392-395, 6 figs. Quicksand is defined as "a temporary condition of a soil which ceases to exist after a normal state of ground water has been restored." Many of troubles encountered from quicksand can be avoided, it is held, by adoption of more scientific methods of handling. Paper read before New England Water Works Assn.

QUICKSILVER

See FLOTATION, Quicksilver Ore; MERCURY.

R

RADIAGRAPH

See OXY-ACETYLENE CUTTING, Radiagraph.

RADIATION

Coefficient of. Determination of Radiant Heat given off by a Direct Radiator, John R. Allen and Frank B. Rowley. Jl. Am. Soc. Heating and Ventilating Engrs., vol. 26, no. 2, March 1920, pp. 305-318. Account of tests conducted at University of Minnesota. From data obtained approximate value of radiation coefficient in Stefan and Boltzmann's law is determined for rusty, clean, and painted cast iron, and aluminum paint.

Constants, Measurement of. Constants of Radiation of a Uniformly Heated Inclosure. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 357, Jan. 16, 1920, pp. 529-535. Experimental data on atmospheric absorption as it affects measurements of radiation constants, together with recalculation of coefficient of total radiation of uniformly heated inclosure taking into consideration all losses by reflection from receivers as well as losses by atmospheric absorption.

Cylindrical Wall. On Radiation from a Cylindrical Wall, A. C. Bartlett. Lond., Edinburgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 325, July 1920, pp. 111-113. In paper under above heading in same journal (Mar. 1920), an expression is obtained by a laborious process for amount of heat radiated from inner walls of a vertical cylinder on to a horizontal coaxial disk; writer claims it is possible to deduce result by method described which is claimed to be not only much simpler but more generally applicable.

Data, Intercomparison of. Methods for Computing and Intercomparing Radiation Data, Dept. Commerce, Scientific Papers of Bur. of Standards, No. 360, Jan. 31, 1920, pp. 617-624. Method is based on application of Planck formula. Table of values of log $(e^u - 1)$ is given, and also chart for intercomparison of thermal radiation constants with similar data obtained indirectly from ionization potential, photoelectric, and X-ray measurements.

Melting Point, Gold and Palladium. The Relative Brightness of Black-Body Radiation at Melting Point of Gold and Palladium (Ueber die relative Helligkeit schwarzer Strahlung beim Gold- und Palladiumschmelzpunkt), Fr. Hoffmann and W. Meissner. Annalen der Physik, vol. 60, no. 3, Oct. 20, 1919, pp. 201-232, 13 figs. Writers describe two methods employed for measurements. Relative brightness at melting point of gold and palladium is given as 81.5 by wave length 0.6554 μ.

Meters. New Apparatus for the Measurement of Radiation (Neue Apparate zur Strahlungsmessung), W. Voege. Physikalische Zeitschrift, vol. 21, no. 11, June 1, 1920, pp. 288-296, 7 figs. It is concluded that the Zeiss cells, in regard to sensibility, freedom from inertia, and durability, represent a marked improvement, and the thermopiles equipped with these cells are equal to the best linear and surface bolometers. In connection with the parabolic mirror the cells form a radiation meter of the greatest sensibility and simplicity.

Planck's Formula, Modification of. A Modification of the Planck Radiation Formula Based on Experiments (Ueber eine Modifikation der Planckschen Strahlungsformel auf experimenteller Grundlage), W. Nernst and Th. Wulf. Berichte der deutschen physikalischen Gesellschaft, vol. 21, no. 11-12, June 30, 1919, pp. 294-337. Notes on methods of calculations; observations of Kurlbaum and Rubens, etc. It is authors' belief that final theory of radiation will be based on the Bohr model, but that properties of this model are not yet well enough determined to serve as basis for such a theory. Report from Physical-Chem. Inst. of the University of Berlin.

Resonance. See OPTICS, Resonance Radiation and Spectra.

Solar, Measurement of. A New Spectrophyheliometer and Measurements of the Component Radiations from the Sun and from a Quartz-Mercury Vapor Lamp, W. W. Coblentz and H. Kahler. Dept. Commerce, Sci. Papers of Bur. of Standards, no. 378, Apr. 9, 1920, pp. 233-247, 3 figs. Apparatus consists of quartz spectograph and cylindrical quartz condensing lens placed upon simple equatorial mounting. Collimating telescope is pointed directly toward sun in order to avoid ultra-violet absorption which occurs in heliostat mirrors. Radiometric measurements are made by means of specially constructed bismuth-silver thermopile.

Stefan-Boltzmann Constant. The Value of the Stefan-Boltzmann Radiation Constants (Ueber die Grösse der Stefan-Boltzmannschen Strahlungskonstanten), Walther Gerlach. Zeitschrift für Physik, vol. 2, no. 1, 1920, pp. 76-82, 2 figs. It is demonstrated that the new determination based on measurements by M. Kahanowicz is not as reliable as previous determinations made by Coblentz and Emerson and by author. Report from physical laboratory of the Friedr. Bayer & Co. Dye Factory.

RADIATORS

Automobile-Engine. See AUTOMOBILE ENGINES, Radiators.

Radiant Heat from. See RADIATION, Coefficient of.

RADIO COMMUNICATION

Aircraft. See AIRCRAFT, Radio Signaling.

Aircraft Radio Sets. Radio Apparatus for Aircraft and Ground Stations, E. M. Kinney. Proc. Engrs. Soc. Western Pennsylvania, vol. 36, no. 1, Feb. 1920, pp. 1-21 and discussion pp. 22-24, 13 figs. Aircraft radio sets manufactured for the Navy by the General Electric Co.

Distress-Calling Device. The New Marconi Distress Calling Device. Wireless World, vol. 7, no. 84, Mar. 1920, pp. 695-698, 6 figs. Apparatus transmits automatically series of dots at rate of 180 per minute, this number having been chosen as being not too fast for operator to count and time and not too slow to be interfered with by ordinary transmissions. Special relay is constructed to respond to prede-

termined signal which is operated by change in current produced by reception of such signal.

Guiding Aerial and Marine Craft. An Electrical Signaling Method for Guiding Aerial and Marine Craft, Robert H. Marriott. Proc. Inst. Radio Engrs., vol. 8, no. 5, Oct. 1920, pp. 345-357, 3 figs. Signal carrying conductor along course of vessel, and means capable of indicating proximity and direction of signal conductor are described and discussed, including various forms and combinations. Ocean-going vessels entering harbors are chiefly considered, same principle being applicable to other craft and channels, air ships, and so on. Experimental tests of systems are given in detail, with numerical data.

High-Power Continuous Apparatus. High Power Continuous Wave Radio Apparatus. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 161-166, 9 figs. Alexanderson system for radiotelegraph and radiotelephone transmission.

Instruments. Standardization of Electrical Indicating Instruments, for Use with Radio Apparatus, G. Y. Allen. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 494-500, 15 figs. Points out benefits which combatant armies enjoyed as results of standardization.

Long-Distance. Long Distance Radio Communication in Chile, E. W. Fielding. Proc. Inst. Radio Engrs., vol. 8, no. 1, Feb. 1920, pp. 59-63, 4 figs. Description of Chilean radio stations at Llanquihue and Punta Arenas. Best wave length and power for this 875-mile transmission are given and effects of strays, their reduction, and signal fading are discussed.

Naval Aircraft. Naval Aircraft Radio, T. Johnson, Jr. Proc. Inst. Radio Engrs., vol. 8, nos. 1 and 2, Feb. and April 1920, pp. 3-58, 61 figs., and 87-134 and discussion pp. 135-141, 46 figs. Application of radio to naval aircraft is discussed, together with difficulties of development, standardization, installation, and operation, especially under stress of war conditions. First operation of radio on naval aircraft, and development of earlier types of sets are described. Development work carried on at Naval Air Stations at Pensacola, Fla., and Hampton Roads, Va., is taken up. Review of standard types of naval aircraft is given together with characteristics of radiating systems applied to them. Consideration is made of air station telephone transmitter and its use in connection with remote control conversation with aircraft.

Submarine. Contribution to the Study of Submarine Radio Communications (Contribution a l'étude des radiocommunications sous-marines), Leon Bouthillon. Revue générale de l'Électricité, vol. 7, no. 21, May 22, 1920, pp. 696-700, 2 figs. Theoretical study. Reference is made to experiments conducted during the war by French and American navies for investigating laws regulating radio communication between land station and a submarine.

[See also RADIOTELEGRAPHY; RADIOTELEPHONY.]

RADIO COMPASS

See NAVIGATION, Radio Compass.

RADIO-ELEMENTS

Classification. The Radio-Elements and Their Classification, P. Curie. Chem. News, vol. 119, no. 3108, Nov. 7, 1919, pp. 211-212. Table showing classification of radio elements in groups possessing the same chemical properties. Translated from Le Radium.

RADIO FREQUENCY

Measurements. Note on Radio Frequency Measurements, Carl Englund. Proc. Inst. of Radio Engrs., vol. 8, no. 4, Aug. 1920, pp. 326-333, 4 figs. After discussing need for radio frequency bridge on grounds of general utility, bridge method is critically compared with indicating, null, and potentiometer methods. Certain precautions in shielding and coil construction are considered and specific form of bridge used by writer is described.

RADIO-THRUST BEARINGS

See BEARINGS, RADIO-THRUST.

RADIOACTIVITY

Alpha Rays. The Relation Between Range and Life of Alpha Rays (Ueber eine Beziehung zwischen Reichweite und Lebensdauer der a-Strahler), F. Kirchhof. Zeitschrift für Physikalische Chemie, vol. 93, no. 5, Sept. 26, 1919, pp. 619-622, 2 figs. Tabulated data are presented which are said to show that range and life of homologous elements are not always of same size range, but are more or less influenced by their relationship with one or another family. Writer believes it is not improbable that the other known inactive elements possess a limited life; and therefore all elements except lead must be characterized as decomposition products of one of the three radioactive families of radium, thorium or actinium.

Monazite. See MONAZITE, Sources and Properties.

Progress During 1918. Progress in Radioactivity During 1918 (Die Fortschritte der Radioaktivität in Jahre 1918), V. F. Hess. Fortschritte der Chemie, Physik und physikalischen Chemie, vol. 15, no. 1, Aug. 15, 1919, pp. 1 to 22. Review of important works, including those obtainable in French and English languages, dealing with alpha rays, radioactive variations, beta and gamma rays, secondary rays, measurements, effects of radioactive radiation, and special physics and special chemistry of radioelements.

Radioactive Elements. A Table of the Radioactive Elements which Indicates their Structure, Ingo W. D. Hackh. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 155-157, 1 fig. Scheme of isotopes showing relationship of system of radioactive elements to periodic system.

RADIOGONIOMETERS

See DIRECTION FINDERS.

RADIOGRAPHY

Applications of. Present-Day Radiography, G. W. C. Kaye. Elecn., vol. 84, no. 2177, Feb. 6, 1920, pp. 142-144, 4 figs. Applications of radiography in examination of metals, examination of wooden parts of airplanes, and for detecting alterations made in oil paintings, are pointed out.

Metals. See METALS, Radiography of.

RADIOMETALLOGRAPHY

Apparatus. Radiometallography, T. Thorne Baker. Elecn., vol. 83, no. 2167, Nov. 28, 1919, pp. 611-612, 1 fig. Apparatus used for testing of metals.

Industrial Applications. Industrial Applications of the X-Rays, V. E. Johnson. Model Engr. & Elecn., vol. 43, no. 1013, Sept. 23, 1920, pp. 253-258, 7 figs. Method of procedure and precautions to be taken.

Procedure. Contrast and Exposure in X-Ray Photographs Through Metals, R. E. Slade. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 52-59, 3 figs. Discusses efficiency of photographic plate as detector and what may be expected from it in the light of present

knowledge of X-rays and photographic processes.

The Apparatus and Procedure of Radiometallography, M. Hector Pilon and Geoffrey Pearce. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 47-51, 10 figs. on 4 supp. plates. Illustrations are presented showing industrial applicability of radiometallography. Writers state that they have succeeded in penetrating steel 50 to 55 mm. thick by X-ray apparatus in conjunction with Coolidge tube.

The Principles Governing the Penetration of Metals by X-Rays, G. Respondek. Trans. Faraday Soc., Appendix, vol. 15, part 2, Feb. 1920, pp. 45-64, 8 figs. Suggestions in regard to practical application of X-rays to investigation of metals.

Research. Investigation of Metals by Means of X-Rays, Frederick Janus and Max Reppchen. Trans. Faraday Soc., Appendix, vol. 15, part 2, Feb. 1920, pp. 2-44, 38 figs. Account of investigations carried out in Munich in the "Scientific Laboratory" and in the "X-Ray Research Establishment" of the Reiniger, Gebbert and Schall A. G., of Berlin Erlangen. Among subjects investigated was locating depth at which faults were situated in specimens.

Researches Into the Industrial X-Ray Examination of Metals at the Laboratories of Messrs. Schneider, Le Creusot, E. Schneider. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 32-34, 10 figs. on 4 supp. plates. Radiographs are given of plates of various thicknesses. It is stated that application of radiometallography enables visual examination to be made of ordinary steels of thicknesses up to 45 mm.

X-Ray Applied to Examination of Metals, W. E. Ruder. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 589-593, 15 figs. Technique, possibilities and limitations of examination of physical condition of ordinarily invisible portion of metallurgical products. Paper read before N. Y. meeting of Am. Iron & Steel Inst.

Steel, Examination of. The Coolidge X-Ray Tube. Foundry Trade Jl., vol. 21, no. 213, Sept. 1919, pp. 657-658, 5 figs. Radiographs of steel castings showing imperfections, chisel marks and flaws.

Using X-Ray in Examination of Steel, Henry S. Rawdon. Iron Trade Rev., vol. 65, no. 20, Nov. 13, 1919, pp. 1329-1332, 16 figs. Photographs illustrating defects observable by radiographic examination.

X-Ray Shadow Photography. The Examination of Materials by X-Rays, W. H. Bragg. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 25-31, 10 figs. on 4 supp. plates. Use of X-ray shadow photography is explained and photographs are presented of various machine parts and their interpretation given.

RADIOMETERS

Measurements with. Measurements with the Radiometer (Messungen am Radiometer), Wilhelm H. Westphal. Zeitschrift für Physik, vol. 1, nos. 1 and 5, 1920, pp. 92-100 and 431-438, 7 figs. No. 1: Investigation of the action of the radiometer in air, hydrogen, argon and carbonic acid at very low pressure and upward, results of which point to possibility of adoption of radiometer for measurement of very low steam pressures. No. 5: Symmetry of curve expressing dependence of radiometer deflection of the logarithm of the gas pressure, which was developed in a previous work, is confirmed by further experiments. A small deviation of symmetry is noticeable only at a pressure of about 0.001 mm. Hg and upward.

Theory of. A Modified Theory of the Crookes Radiometer, Gilbert D. West. Physical Soc. of London, Proc., vol. 32, no. 4, June 15, 1920, pp. 222-231, 6 figs. Short account of theory of Crookes radiometer worked out by Sutherland in 1896. Theory will not explain many radiometric phenomena until modifications, depending on modern knowledge of thermal surface conditions, are made. Radiometer action, especially at the higher gas pressures, would appear to depend essentially on the formation of gas currents near the radiometer vane.

RADIOTELEGRAPHY

Aerials. Frame Aerials for Reception, Their Theory, Design, Construction and Use. Wireless World, vol. 8, no. 6, June 12, 1920, pp. 184-188, 5 figs. It is pointed out that value of so-called reception factor should be chief care in designing frame aerial, and should be as high as possible; of two types of loop aerials most easily made, the solenoid is preferable to flat spiral (or pancake), if only for its simplicity.

Aeronautical Sets. Radio Equipment for Commercial Aircraft, Edgar H. Felix. Aerial Age, vol. 10, no. 6, Oct. 27 and Nov. 3, 1919, pp. 205-207, 4 figs. Description of National Wireless Telegraph Transmitter unit, Simon aircraft transmitter and Simon compact receiving equipment.

Alexanderson System. The Alexanderson System, Elmer E. Bucher. Wireless Age, vol. 7, no. 11, Aug. 1920, pp. 13-23, 27 figs. Performance and operation of system at New Brunswick Station. Very satisfactory results were obtained at distances up to 2500 miles.

American Expeditionary Forces. Wireless in the A. E. F., L. R. Krumm and W. H. Taylor. Wireless Age, vol. 7, no. 4, Jan. 1920, pp. 12-19, 21 figs. Account of organization of Radio Division of Signal Corps and of obstacles which had to be overcome to establish wireless communications at the front.

Amplifiers. An Alternating-Current Zero Method for the Determination of the Grid Sensibility of Amplifier Tubes (Eine Wechselstrom-Nullmethode zur Bestimmung der Gitterempfindlichkeit von Verstärkerröhren), W. Schottky. Telegraphen- u. Fernsprech-Technik, vol. 9, no. 2, May 1920, pp. 31-32, 1 fig. Describes a connection which is being satisfactorily used in tube-testing room of the Werner Works K. Laboratory.

An Amplifier Employing Thermionic Inter-Valve Resistance Couplings, John Scott-Taggart. Elec. Rev. (Lond.), vol. 86, no. 2214, Apr. 30, 1920, pp. 549-550, 1 fig. It is proposed to use in place of ordinary conductors of high impedance a conductive path between cathode and anode. Application of arrangement to reception of wireless signals is explained.

Electrostatic Explanation of Characteristic Curves of Amplifier Tubes (Die elektrostatische Deutung der kennzeichnenden Kurven bei den Verstarkerröhren), M. von Laue. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 3, Aug. 1919, pp. 243-259, 11 figs. Comparison of various types of tubes.

High-Vacuum Amplifiers (Ueber Hochvakuumverstärker), W. Schottky. Archiv für Elektrotechnik, vol. 8, no. 9, Dec. 8, 1919, pp. 299-328, 19 figs. Notes on multiple electrode valves. Comparison of the different types of vacuum tubes, three-electrode valves and other combinations. Review of earlier work on the subject.

New Universal Potentiometer Amplifiers (Sur de nouveaux dispositifs amplificateurs potentiométriques universels), MM. Blondel and Touly. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 557-562, 2 figs. Simplification of

audion amplifier by substituting Wheatstone bridge for potentiometer where Armstrong regeneration principle is employed to reduce number of batteries.

Notes on the Design and Construction of Vacuum Tube Amplifiers, J. Scott-Taggart. Wireless World, vol. 7, no. 80, Nov. 1919, pp. 440-445, 6 figs. Types of low-frequency amplifiers.

Notes on the Design and Construction of Valve Amplifiers, John Scott-Taggart. Wireless World, vol. 7, nos. 81, 83 and 84, Dec. 1919, Feb. and Mar. 1920, pp. 505-508, 671-673 and 701-704, 11 figs. Dec. and Feb.: Detector amplifier; Mar.: Resistance amplifiers.

On the Input Impedance of the Thermionic Amplifier, Stuart Ballantine. Physical Rev., vol. 15, no. 5, sec. series, May 1920, pp. 409-420, 10 figs. Phenomena described are investigated analytically and expressions are developed for values of effective capacity and conductance for various loading conditions. Physical significance of equations is depicted by series of curves, plotted for various load configurations of analysis. Equations are developed for choosing proper inductances for regenerative receiving circuits, and desirability of so designing tubes as to avoid excessive grid-plate capacity is emphasized.

The Design of Multiple-Stage Amplifiers Using Three-Electrode Thermionic Valves, C. L. Fortescue. Jl. Inst. Elec. Engrs., vol. 58, no. 287, Jan. 1920, pp. 65-74 and (discussion) pp. 74-82, 14 figs. Amplifying circuits are illustrated and limitations to effective amplification are discussed.

The Design of Multiple-Stage Amplifiers, C. L. Fortescue. Electrical Review, vol. 85, no. 2192, Nov. 28, 1919, pp. 700-701, 9 figs. Arrangements by which multiple-stage amplification can be obtained. From paper read before Wireless Section of Instn. of Elec. Engrs.

Triode Valves as Electric Amplifiers, W. H. Eccles. Nature, vol. 104, no. 2620, Jan. 15, 1920, pp. 501-502, 3 figs. Explains operation of resistance cascade amplifier.

Two Phenomena Discovered by Means of New Amplifier (Zwei mit Hilfe der neuen Verstärker entdeckte Erscheinungen), H. Barkhausen. Physikalische Zeitschrift, vol. 20, no. 17, Sept. 1, 1919, pp. 401-403, 5 figs. Noises observed in reversing magnetism in iron. Whistling sounds emanating from earth.

Valve Amplifiers (Amplificateurs divers), Marius Latour. Revue Générale de Electricité, vol. 6, no. 21, Nov. 22, 1919, pp. 709-718, 15 figs. Theory of three-electrode valve amplifiers is developed from study of characteristic curves of various lamps of this type.

See also THERMIONIC VALVES, A. C. Generation; Weagant Group Frequency Circuit.

Antennæ. A High Antenna without High Masts. Wireless Age, vol. 7, no. 2, Nov. 1919, pp. 21-23, 23 figs. Scheme proposes to substitute conducting ionized beams, such as search-light beam of ultra-violet rays produced by means of suitable electric arc or mercury-vapor lamp, for wires of antenna for transmission or reception of radio telegraphic and radio telephonic signals.

Antenna Characteristics and Wave-Lengths of Antennae (Constantes d'antenne et longueurs d'ondes d'antennes), A. Press. Révue générale de l'Électricité, vol. 7, no. 17, April 24, 1920, pp. 547-552, 5 figs. Technical. It is found that inductance of a vertical antenna varies with height above ground. Resulting difference in inductance when antenna is horizontal is indicated. It develops that in order that an antennæ group be equivalent to a terminal capacity, wave length employed must be at least three times larger than the fundamental wave length.

Calculation of Antenna Capacity, Louis W. Austin. Proc. Inst. Radio Engrs., vol. 8, no. 2, April 1920, pp. 164-168. Two empirical formulæ—one applying to broad antennæ and the other to elongated antennæ—are given. Results obtained from their use are shown to agree closely with actual experimentally determined values.

Electrodynamics of Antenna Circuits (Zur Electrodynamik von Strahlerkreisen), Karl Wagner. Archiv für Elektrotechnik, vol. 8, no. 5, Sept. 15, 1919, pp. 145-183, 25 figs. Electromagnetic diagrams of principal antenna forms. Details of antennæ with lengthening coil, with reduced capacity, with end-capacity, and with intermediate circuit. Contributed by Laboratory of Soc. of Wireless Telegraphy.

Quantitative Experiments with Coil Antennas in Radio Telegraphy, Louis W. Austin. Proc. Inst. Radio Engrs., vol. 8, no. 5, Oct. 1920, pp. 416-420 and (discussion) pp. 421-423. Formulæ for received current in loop receivers are derived and compared with series of observations at various wave lengths.

The Regulation of Receiving Antennae (Le réglage des antennes de réception), Michel Adam. Radio électricité, vol. 1, no. 3, Aug. 1920, pp. 148-153, 9 figs. Scheme for regulating antennae by means of simple coil and condenser.

The Use of Ground Wires at Remote Control Stations, A. Holt Taylor and A. Crossley. Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 171-192, 9 figs. It is stated that by utilizing subterranean receiving antenna, it has been proven possible to install receiving stations in immediate vicinity of transmitting stations. Design of underground antennæ, construction of shielded rooms for receiving sets, and mode of "remotely" controlling nearby transmitting station are described. Lay-out and installation of several such Naval "remote" control stations is given.

Theoretical Research on Radiation of Antenna Systems (Theoretische Untersuchungen über die Strahlung von Antennensystemen), Max Abraham. Archiv für Elektrotechnik, vol. 8, nos. 2 and 3, July 24, 1919, pp. 92-116, 2 figs. Basic formulæ, radiation of two synchronous antennae, radiation resistances, etc., are discussed.

See also Coil and Antenna.

Atmospherics, Reducing Effects of. See Receivers.

Audions. Audion Connections (Ueber die Schaltungsweisen des Audions), D. Coster. Physikalische Zeitschrift, vol. 20, no. 24, Dec. 15, 1919, pp. 579-584, 9 figs. Discussion of connections with which it is possible by means of a battery to generate alternating current of a determined period. Writer claims to have demonstrated that the audion must be regarded as an alternating-current exciter with constant internal resistance.

Contribution to the Theory of the Audion Amplifier; Requirements for Starting and the Damping of Low-Amplitude Oscillations Obtained from Audions (Contribution à la théorie des audions générateurs; condition d'amorçage et degré d'amortissement des oscillations de faible amplitude obtenues par ces appareils), André Blondel and Charles Lavanchy. Revue générale de l'Électricité, vol. 6, no. 26, Dec. 27, 1919, pp. 923-930, 2 figs. Technical examination of conditions of "stabilization of amplitude."

Graphical Study of the Operation of Resonator Audions as Sensibilized Receivers and as Dampers (Etude graphique du fonctionnement des audions à circuit résonant comme récepteurs sensibilisés ou comme désamortisseurs),

M. André Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1377-1382, 2 figs. Example of dynamic characteristics of audion generator deduced by anamorphosis from static characteristic of audion on hypothesis that saturation current remains invariable.

Graphical Theory of Audion Generators and Calculation of Amplitude of Oscillations (Théorie graphique des audions générateurs et calcul de l'amplitude des oscillations), A. Blondel. Radioélectricité, vol. 1, nos. 1 and 2, June and July 1920, pp. 7-13 and 63-72, 6 figs. June: Starting with idea that audion generator requires great amplitude in variation of plate current, writer transforms graph of static characteristics of voltage and amperage of plate into dynamic by a graphical method. July: Calculation from polar diagram of conditions of operation of audions.

Notes on the Theory and Calculation of Audio Frequency Valve Magnifiers, J. K. Catterson-Smith. Radio Rev., vol. 1, no. 10, July 1920, pp. 473-480, 9 figs. Article deals with troubles which arise through the self-capacity of the windings of transformers used in valve magnifiers. Theory of valve and transformer coupling is developed and formulæ are derived for use in calculating windings and size of iron core. A first approximation for capacity between layers is given.

The Audion—Its Action and Some Recent Applications, Lee De Forest. Jl. Franklin Inst., vol. 190, no. 1, July 1920, pp. 1-38, 25 figs. Account of main achievements to the credit of the three-electrode audion, or triode. Future of radio signalling at sea, it is said, lies with telephone rather than telegraph.

The Audion Oscillator, R. A. Heising. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 5, May 1920, pp. 471-484, 40 figs. Also in Physical Rev., vol. 16, no. 3, Sept. 1920, pp. 216-237, 14 figs. Curves and description are for an average audion of a certain type and largely for certain adjustments in the circuit. Sets of curves for other audions will have the same general shapes but different maxima.

Theory of the Audion as a Generator of Maintained Oscillations. Conditions of Operation and Extent of Damping of the Low-Amplitude Oscillations Obtained with It. (Contribution à la théorie des audions générateurs, condition d'amorcage et degré d'amortissement des oscillations de faible amplitude obtenues par ces appareils), André Blondel and Charles Lavanchy. Revue générale de l'Electricité, vol. 6, no. 25, Dec. 20, 1919, pp. 875-893, 8 figs. In article published in Journal de Physique, July 1919, Mr. Blondel developed theory of audion from theorem of Hurwitz. In present article writers recall this theory and establish general theory of slightly damped oscillations by elementary reasonings without having recourse to Hurwitz's theorem.

See also VACUUM TUBES, Manufacture.

Automatic Calling. An Automatic Call Device, B. Binyon. Wireless World, vol. 8, no. 5, May 29, 1920, pp. 158-164 and (discussion) pp. 165-167, 10 figs. Description and illustrations of a mechanical "call" or watchkeeping apparatus which may be attached to any radio receiver in place of, or in addition to, head telephones usually worn by operator, and consisting of two units, namely, a sensitive relay operated by thermionic valves, and mechanical selector. Paper read before Wirleess Soc. of London.

Aviation Applications. Telegraphy and Aviation (La télégraphie et l'aviation), M. Delfieu. Annales des Postes, Télégraphes et Téléphones, vol. 8, no. 3, Sept. 1919, pp. 382-397, 2 figs. Recent progress made in establishing communication between an airplane and the earth. Special reference is made to tests conducted during war.

Capacitive Coupling. Capacitive Coupling in Radio Circuits, L. E. Whittemore. Physical Rev., vol. 15, no. 6, June 1920, pp. 559-562, 1 fig. Capacitive coupling is used in one type of radio receiving apparatus and has been proposed for use in transmitting sets. Other uses also mentioned.

Coil and Antenna. The Coil in the Radiation Field as Compared with the Antenna (Die Spule im Strahlungsfelde, verglichen mit der Antenne), Max Abraham. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 3, Aug. 1919, pp. 259-269. Oscillation equation, undamped waves, radiation resistance of coil and aperiodic disturbances are discussed.

Coils. Universal, Honeycomb and Lattice Coils, O. C. Roos. Wireless Age, vol. 8, no. 1, Oct. 1920, pp. 12-19, 20 figs. Laws governing width of coils in terms of pitch and advance; odd and even lattices; general relations involving levels and layers; studies in radial and axial transposition with resultant banking of wires and levels; handwinding and tapping of lattices; swing-angle as related to diameter of wire; design-factors.

Detectors. A Useful Crystal Detector. Wireless World, vol. 8, no. 6, June 12, 1920, p. 212, 2 figs. Detector described is said to be almost perfectly steady, small, sensitive, simple and inexpensive to construct.

An Oscillation Method for Testing the Inertia of Contact Detectors (Eine Schwebungsmethode zur Prüfung der Trägheit von Kontaktdetektoren), Robert Ettenreich. Physikalische Zeitschrift, vol. 21, no. 8, Apr. 15, 1920, pp. 208-214, 12 figs. For the determination of the critical frequency at which a detector fails because of its electric inertia, an electric resonance method based on the interference principle is developed, whereby the detector lies in an aperiodic circuit which transmits the oscillations of two audion generators to one measuring circuit.

On the Detecting Efficiency of the Thermionic Detector, H. J. van der Bijl. Proc. Inst. Radio Engrs., vol. 7, no. 6, Dec. 1919, pp. 603-632 and (discussion) pp. 633-635. 15 figs. Method of determining detecting efficiency of vacuum tubes by feeding them with radio frequency current modulated at audio frequency.

The Use of Three-Electrode Lamp-Valves by the French Military Radiotelegraphy (L'emploi des lampes-valves à 3 électrodes par la radiotélégraphie militaire), C. Gutton. Bulletin de la Société d'Encouragement pour l'Industrie nationale, vol. 131, no. 6, Nov.-Dec. 1919, pp. 389-408, 11 figs. Explains operation of three-electrode valve as detector and as generator of electric oscillations.

Triode Amplifications and Detector Sensitivity, A. Press. Electrician, vol. 84, no. 2173, Jan. 9, 1920, pp. 35-36, 3 figs. Formulæ for potential and current magnifications and for detector sensitivity.

See also Weagant Group Frequency Circuit; THERMIONIC VALVES, A.C. Generation.

Developments. Recent Progress in Wireless Telegraphy, John O. G. Cann. Jl. Eng. Inst. Can., vol. 3, no. 5, May 1920, pp. 239-243, 8 figs. Writer states there are several methods in use today for generating electrical oscillations which he classifies as the spark, the Poulsen arc, the dynamic or alternator, and the valve or thermionic, and each of these methods is described. Notes on direction finding, static elimination and high-speed transmission.

Directed Reception. Directed Wireless Telegraphy in the War Zone and the Directed Reception (Die gerichtete Funkentelegraphie im Felde und der Richtempfang), Hans Schäfer.

Prometheus, vol. 31, nos. 5, 6 and 7, Nov. 1, 8 and 15, 1919, pp. 35-38, 43-45 and 51-52, 4 figs. Technical discussion of the directed reception by which electric waves are confined to a certain area and directed to receiving station, and account of its use in the war in connection with airplane and Zeppelin flights, U-boat expeditions, etc.

Direction Finders. See DIRECTION FINDERS.

Direction Finding. The Use of Reaction with a Frame Aerial, Henry B. Jackson. Wireless World, vol. 8, no. 9, July 24, 1920, pp. 324-327 and (discussion), pp. 327-328, 2 figs. Account of experiments in which sensitiveness of frame aerial used for direction finding was greatly increased by introducing of reaction. Paper read before Wireless Soc. of London.

Direction Senders. New Experiments with Radiotelegraphic Direction Senders (Neue Versuche über funkentelegraphische Richtsender), Franz Kiebitz. Jahrbuch für drahtlose Telegraphie u. Telephonie, vol. 15, no. 4, Apr. 1920, pp. 299-310, 6 figs. By means of suitable regulation of the current strength of antennae it was possible to transmit a message to a distant station where it was clearly understood without being deciphered by six stations in closer vicinity to sender station. Problem is thus solved of telegraphing not only on straight lines, but also on circles.

Distress-Calling Device. The New Marconi Distress Calling Device. Wireless Age, vol. 10, no. 7, July 1920, pp. 18-19, 6 figs. Description of device by means of which bell at a considerable distance can be rung by wireless and act as a signal of distress.

Experiments. Some Wireless Wonders, A. A. Campbell Swinton. Wireless World, vol. 8, no. 2, Apr. 17, 1920, pp. 47-52, 6 figs. Discussion of thermionic valve or tube, and practical demonstration of experiments in wireless telegraphy received without use of any external aerial, waves being received inside the room by means of a flat coil, or loop, only about a yard in diameter.

Frequency Changers. Characteristic Curves of Frequency Converters Used in Radiotelegraphic Transmission (Courbes caractéristiques des doubleurs de fréquence appliqués à la transmission radiotélégraphique), T. Minohara. Revue générale de l'Électricité,) vol. 7, no. 9, Feb. 28, 1920, pp. 283-291, 27 figs. Curves are obtained directly from magnetization curves of cores. It is found that if secondary tension wave is sinusoidal, quantity of energy in action is limited by fact that relation of primary alternating current to direct current of excitation cannot exceed value of 1.66. Experimentally-constructed oscillographs are presented confirming theoretical results.

Devices for Increasing Frequency in Stationary Transformers and Apparatus, and Transmitters Operating with Them (Anordungen zur Frequenzsteigerung in ruhenden Transformatoren und Apparaten, und Sender, die mit solchen arbeiten). Jahrbuch des drahtlosen Telegraphie und Telephonie, vol. 14, no. 6, Nov. 1919, pp. 629-636, 5 figs. Details and illustrations of war patents recently released.

Generators. See Audions; ELECTRIC GENERATORS, A.C., High-Frequency.

German Army. Radiotelegraphy in the German Army (Telefunken in deutschen Kriegsheere), C. W. Kollatz. Elektrotechnischer Anzeiger, vol. 36, nos. 92 and 93, Aug. 31 and Sept. 2, 1919, pp. 430-432 and 437-438, 8 figs. Details and illustrations of portable and traveling wireless stations (both horse-drawn and automobile). It is stated that first apparatus for undamped waves was delivered at the front in May, 1918, and gave satisfactory service. Abstracts from article in Telefunkenzeitung (May 1919), presented by Soc. of Wireless Telegraphy.

Wireless Telegraphy Apparatus in the German Army (Les appareils de télégraphie sans fil de l'armée allemande), A. Salomon. Revue générale de l'Électricité, vol. 6, no. 24, Dec. 13, 1919, pp. 833-843, 18 figs. Outfit for field service. Notable characteristic of emission sets is that they all operate by indirect excitation with various wave lengths.

Harmonics in Current-Wave Transmission. Harmonics in C. W. Transmission, L. A. T. Broadwood. Wireless World, vol. 8, no. 3, May 1920, pp. 82-91, 15 figs. Main faults of this type of circuit are said to be that (1) grid is over-excited which is responsible for flat-topped plate wave; (2) there is no arrangement to correct grid voltage to insure that oscillations will take place about mid-point of characteristic, hence plate wave is likely to be asymmetrical; (3) as aerial is directly connected to plate coil, any harmonics in plate current wave will certainly resonate on aerial which has distributed inductance and capacity.

High Altitudes. Wireless Telegraphy at High Altitudes (Funkentelegraphie in grösseren Höhen), Felix Jenzsch-Graefe. Jahrbuch für drahtlose Telegraphie u. Telephonie, vol. 15, no. 4, Apr. 1920, pp. 311-317, 3 figs. Relates experiences at the front where it was observed that frequently at a height of about 6000 m. communication with the earth and reception in aeroplane was no longer possible. Causes for this failure were investigated and remedies suggested.

Hourly Signals. The Reception of Hourly Signal. (La réception des signaux horaires), Michel Adams. Radioélectricité, vol. 1, no. 2, July 1920, pp. 97-101, 8 figs. Scheme of signals sent out from Eiffel tower, Paris.

International Regulations. International Regulations (Réglementations internationales), P. Brenot. Radioélectricité, vol. 1, no. 3, Aug. 1920, pp. 154-165. Legislation adopted at conferences in London in 1912, Paris in 1912-1913 and London in 1913-1914.

Intervalve Transformers. The Design of Intervalve Transformers, J. K. Catterson-Smith. Elecn., vol. 85, no. 2211, Oct. 1, 1920, pp. 388-390, 10 figs. Application to low-frequency aperiodic magnifiers used in radiotelephonic circuits.

Italian Navy. The Rome Radio Station of the Italian Navy, Cyril F. Elwell. Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 193-198, 5 figs. Design details of wooden mast 714 ft. high are specially noted.

Long-Distance Transmission. The Efficiency of Aerials and the Power Required for Long Distance Transmission, G. W. O. Howe. Eng., vol. 110, no. 2854, Sept. 10, 1920, pp. 357-359, 9 figs. Also in Elecn., vol. 85, no. 2208, Sept. 10, 1920, pp. 298-300, 3 figs. Calculations and equations. Paper read before Eng. Section, British Assn. for Advancement of Science.

Masts, Guy Ropes for. The Calculation of Loads in Guy Ropes for Masts or Towers, C. T. G-Hopper. Radio Rev., vol. 1, no. 4, Jan. 1920, pp. 161-173, 6 figs. Six cases are taken up, (1) mast stayed by ropes attached to top; (2) mast stayed by ropes attached to intermediate point; (3) mast stayed at two points, one being the top; (4) mast stayed at two points, neither being at the top; (5) mast stayed at more than two points; and (6) when guy ropes are duplicated and form an angle with each other.

Musical Note Production. Action of Middle Frequency Alternator on Quenched Spark Gap (Das Arbeiten der Mittelfrequenzmaschine auf den Löschfunkensender), Karl Schmidt. Elek-

trotechnische Zeitschrift, vol. 40, no. 45, Nov. 6, 1919, pp. 562-564, 7 figs. Writer explains that in order to obtain a musical note, proper adjustment of alternator on oscillation circuit is of great importance; besides this, spark extinguisher and effective coupling of antenna circuit and impulse circuit are necessary. Unless these three conditions are fulfilled, no pure tone can be obtained.

Musical Notes, Reception of. Musical Reception with Continuous Waves Without Local Oscillations, L. W. Austin. Jl. Washington Acad. Sciences, vol. 10, no. 8, April 19, 1920, pp. 223-226, 2 figs. Diagram of connections for toothed-wheel contact maker, provided with brush bearing on face of wheel or axle in such a way as to produce steady contact, while second brush is adjusted so as to touch the teeth. It is said that with this arrangement reception of musical notes can be obtained with continued oscillations.

Nauen Station. The Wireless Central Station at Nauen (Die drahtlose Grossstation Nauen). Elektrotechnische Zeitschrift, vol. 40, no. 51, Dec. 18, 1919, pp. 665-667, 6 figs. Account of its development, by von Arco. Description of the high-frequency machine transmitter, by W. Dornig, including details and illustrations of the antennae, the 500-kw. high-frequency generator, experimental station, etc.

Navy Radio Service. The United States Naval Communication Service, S. W. Bryant. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919, pp. 751-770. Establishment of Navy Radio Service for developing continuous communication with fleets and among various subdivisions of fleets and for coördinating all naval communication facilities so as to provide rapid and reliable interchange of information between all naval organizations afloat and ashore.

Oscillations. An Experiment on Impulse Excitation, John H. Morecroft. Proc. Inst. Radio Engrs., vol. 8, no. 1, Feb. 1920, pp. 75-84, 12 figs. Oscillographic investigation of current produced in oscillatory circuit by brief rectangular pulse of e.m.f. directly introduced into circuit. It was found that pulse having duration of one-half natural period of circuit produced maximum disturbance.

New Method of Calculating in Radiotelegraphy by Separating Real Power and Reactive Power (Nouvelle méthode de calcul par la séparation des puissances, appliquée à la radiotélégraphie), P. Poucherot. Radioélectricité, vol. 1, no. 2, July 1920, pp. 73-77. Calculations of alternating currents by considering real power and reactive power separately. Method is illustrated in example of antenna to send maintained oscillations of 6000 meters in length.

Phenomena Caused by Current Interruption in Oscillatory Circuits (Vorgänge bie Stromunterbrechung in Schwingungskreisen), Gustav Zickner. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 5, Oct. 1919, pp. 478-493, 6 figs. Results of experimental investigation of oscillatory phenomena. Excerpts from paper read in 1914 before Physical Inst. of the Berlin High School of Commerce, referring to electromagnetic oscillations.

See also Audions; Detectors; TRIODE VALVES; THERMIONIC VALVES.

Plate Circuit-Antenna Connection. The Effect of Direct Connection of Plate Circuit with the Antenna. Wireless Age, vol. 7, no. 2, Nov. 1919, pp. 23-24, 2 figs. It is said that direct connection of plate circuit with antenna impresses alternate component of plate current upon antenna "thereby avoiding the necessity of an inductive coupling between the plate circuit and antenna and the use of a separate coil."

Position Finding in Aeroplanes. Wireless Telegraphy for Position-Finding in Aeroplanes (Funkentelegraphische Ortsbestimmung für Luftfahrzeuge), Max Dieckmann. Luftfahrt, vol. 24, no. 4, Apr. 1, 1920, pp. 57-59, 12 figs. Account of observations made in Zeppelin dirigibles in the interest of direction-finding with frame and loop antennae, but without high-frequency amplifiers. Describes type of hanging antenna which, as direction antenna, has advantage of not operating bilaterally and of recording measurements definitely within 360 deg.

Poulsen Arc. The Poulsen Arc, Ellery W. Stone. U. S. Naval Inst., Proc., vol. 46, no. 209, July 1920, pp. 1049-1073, 17 figs. Theory and operation of Poulsen arc for long-distance radio transmission.

The Poulsen System of Radiotelegraphy, C. F. Elwell. Elecn., vol. 84, no. 2193, May 28, 1920, pp. 596-599, 7 figs. History of development of arc methods. It is shown that Poulsen arc system is today doing a great deal of world's long-distance wireless telegraphy.

Radiation Fields. The Quantitative Determination of Electromagnetic Radiation Fields in Wireless Telegraphy (Ueber die quantitative Bestimmung elektromagnetischer Strahlungsfelder in der drahtlosen Telegraphie), Heinrich Rausch von Traubenberg. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 6, Nov. 1919, pp. 569-578, 3 figs. Notes on direct and indirect methods both in connection with derivation of the theoretic principles and and in practical measurements. Application of indirect method is said to be more complicated and more subject to errors than the direct method, but, on the other hand, can be used for measurement of much smaller fields. Results of measurement of magnetic fields at the Nauen station showed that for measuring at distance of 120 km. indirect method only can be used. Writer mentions that preliminary experiments suggest possibility of determining fields of American stations in Europe. Report from the Laboratory of the Wireless Telegraphy Co. in Berlin.

Radiogoniometers. See DIRECTION FINDERS.

Radiogoniometric Stations. European Radiogoniometric Stations (Les stations radiogoniometric européennes). Radioélectricité, vol. 1, no. 1, June 1920, pp. 38-39, 1 fig. List of French, English and German stations.

Railway Trains. Wireless Communication on the Lackawanna Railroad. Telegraph and Telephone Age, vol. 38, no. 3, Feb. 1, 1920, pp. 67-68, 3 figs. Radio installation for communication between main terminal stations and trains when regular wire lines might be out of commission due to storm or other causes.

Received Currents. The Measurement of Received Radio Currents with the Electrometer, E. O. Hulbert and G. Breit. Physical Rev., vol. 15, no. 5, sec. series, May 1920, pp. 405-408, 2 figs. Describes new method for accurate measurement of received currents by means of the quadrant electrometer connected in plate circuit of an electron tube which is used either singly or as detector tube of a multistage amplifier. In order to employ such an arrangement to measure signal intensity, relation between electrometer deflection and effective input voltage must be known, and a condenser potentiometer for such calibration has been devised.

Receivers. A Medium Wave Regenerative Receiver, Ernest G. Underwood. Wireless Age, vol. 7, no. 3, Dec. 1919, pp. 25-26, 3 figs. Designed for use on antenna of about 200 m. natural period.

A Short Wave Receiver, F. O. Read. Wireless World, vol. 8, no. 14, Oct. 2, 1920, pp.

477-478, 2 figs. Describes tuner designed for very short wave lengths and said to be efficient, especially when using a single valve as a rectifier and amplifier by means of the regenerative method.

A System for the Reception of Continuous Waves, J. Scott-Taggart. Wireless World, vol. 7, no. 82, Jan. 1920, pp. 593-598 and (discussion) pp. 598-601, 2 figs. Also Elec. Rev. (Lond.), vol. 85, no. 2196, Dec. 26, 1919, pp. 808-810, 1 fig. Arrangement said to be capable of "stand-by" and "tuned" adjustment. Paper read before Wireless Soc. of Lond.

Measuring and Comparing Intensities of Wireless Telegraphy Receivers (Mesure et comparaison des intensités dans le récepteurs de télégraphie sans fil). Revue générale de Électricité, vol. 7, no. 10, March 7, 1920, pp. 325-328, 2 figs. Method suggested consists in producing equalization of current to be measured and an auxiliary current of the same frequency and form, created by small emitter, the inductive action of which upon the reception can be varied by operator between known limits by progressive steps. Equalization of currents is effected by means of a telephone receiver.

Some of the Problems of Atmospheric Elimination in Wireless Reception, Philip R. Coursey. Wireless World, vol. 8, no. 6, June 12, 1920, pp. 191-201, 11 figs. Various proposed methods of reducing effects of atmospherics are classified as intensity limiters, directional reception methods, filtering circuits, and methods dependent upon aerial form, each of which is briefly considered and chief features of each class indicated. Paper read before Wireless Soc. of Lond.

See also Audions.

Receiving Circuits. A Non-Radiating Wireless Receiving Circuit for the Reception of Damped and Undamped Waves, John Scott-Taggart. Elec. Rev. (Lond.), vol. 85, no. 2190, Nov. 14, 1919, pp. 614-615, 1 fig. Scheme designed to prevent formation of radiations from aerial of steady stream of feeble continuous waves, which are originated in ordinary vacuum-tube receiving circuits and interfere with other receiving stations within a few miles' radius.

Long Wave Reception and the Elimination of Strays on Ground Wires (Subterranean and Submarine), A. Hoyt Taylor. Proc. Inst. Radio Engrs., vol. 7, no. 6, Dec. 1919, pp. 559-583, 11 figs. Question of optimum length of ground wires for reception at given wave length is discussed and experimental data are given.

On a New Valve Circuit for the Reception of Electric Waves, G. Leithauser. Wireless World, vol. 7, no. 79, Oct. 1919, pp. 386-388, 3 figs. Oscillatory circuit is symmetrically placed with respect to two high resistances which are wound on bobbins of small diameter; variations of potential across condenser are transferred to grid and filament by means of additional blocking condensers. Translated from Jahrbuch der drahtlosen Telegraphie und Telephonie, July 1919.

Reception. Graphic Reception of Wireless Telegraphy Messages by Means of Extremely Low Frequency Amplifiers and Pen Oscillographs (Amplificateurs de très basse fréquence et oscillographes à plume. Leur application à l'inscription des signaux de télégraphie sans fil), Henri Abraham and Eugène Bloch. Revue Générale de l'Électricité, vol. 7, nos. 7 and 8, Feb. 14 and 21, 1920, pp. 211-222, 9 figs. and pp. 255-272, 17 figs. Principle of operation is: amplification, first made at high frequency and subsequently at low frequency, is completed by amplification at extremely low frequency of same rhythm as Morse signals. Valve amplifiers are described. Rôle of amplifiers in eliminating Foucault currents and electric fogs is explained.

Reception Aboardship. The Diffraction of the Field by a Cylinder and Its Effect on Directive Reception on Board a Ship, René Mesny. Radio Rev., vol. 1, no. 12, Sept. 1920, pp. 591-597, 5 figs. Formula for deviation of radiogoniometric bearings taken on a ship.

Rectifiers. See RECTIFIERS.

Relay, Trigger. A Trigger Relay Utilising Three-Electrode Thermionic Vacuum Tubes, W. H. Eccles and F. W. Jordan. Radio Rev., vol. 1, no. 3, Dec. 1919, pp. 143-148, 2 figs. Describes one-stroke relay which when operated by small triggering electrical impulse undergoes great changes in regard to its electrical equilibrium and then remains in new condition until reset. Paper read before British Assn. for Advancement of Sci.

Static Interference. Radio Frequency Interference Balance. Wireless Age, vol. 7, no. 3, Dec. 1919, pp. 21-23, 3 figs. Arrangement provided with auxiliary system for balancing out static disturbance with respect to receiving device.

Static Elimination by Directional Reception. Greenleaf W. Pickard. Proc. Inst. Radio Engrs., vol. 8, no. 5, Oct. 1920, pp. 358-394 and (discussion) pp. 395-415, 30 figs. Writer considers possible origins of static and inclines toward solar origin. He finds that static comes from all directions, with maximum intensity from above and maximum frequency from horizon. Probable static wave form is single highly damped pulse.

Stations. New Stations. Radio Service Bulletin, no. 42, Oct. 1, 1920, pp. 2-8. Lists of commercial land and ship stations, alphabetically by names of stations.

New York Radio Central Station. Wireless Age, vol. 7, no. 11, Aug. 1920, pp. 10-12, 3 figs. Details of a super-powered radio station to be erected near New York for communication with five nations.

Subterranean Wireless Telegraphy Station Organized at Paris during the War (Organisation d'un grand poste de télégraphie sans fil souterrain pendant la guerre). Radioélectricité, vol. 1, no. 1, June 1920, pp. 14-18, 9 figs. Antennæ consisted of two steel cables stretching from Eiffel tower to the two towers of the Trocadero Palace. Machinery was located in tunnel which was under construction for additional line of Paris subway.

The LaFayette Radiotelegraphic Station (La station rediatélégraphique La Fayette). Radioélectricité, vol. 1, no. 2, July 1920, pp. 78-81, 3 figs. Antenna is supported by eight metal towers, 825 ft. high, successively spaced apart a distance of 1320 ft. and forming a rectangle 1960 ft. by 1320 ft. Wave length used is 12½ to 15½ miles.

The Military Long-Distance Wireless Stations of the Central Powers in the World War (Die militärischen Grossfunkstellen der Mittelmächte im Weltkriege). Telegraphen- u. Fernsprech-Technik, vol. 8, no. 6, Sept. 1919, pp. 93-94. Details of German station at Königswusterhausen near Berlin, Austrian station at Pola, Turkish station on the Bosphorus, and station of the German military headquarters connecting headquarters with distantly located army staffs in Balkan states and in Orient. Description of a heavy traveling station enclosed in two large furniture vans.

The New Radio Station at Lyons, Leon Faljan. Wireless Age, vol. 7, no. 12, Sept. 1920, pp. 11-14, 7 figs. Features are Elwell design of Poulsen arc and double system of speed control of 20,000-cycle generator set.

The Radio Telegraphic Station at Rome (San Paolo), B. Micchiardi and G. Pession and G.

Vallauri. Proc. Inst. Radio Engrs., vol. 8, no. 2, April 1920, pp. 142-163, 16 figs. Description covers antenna, down-leads, ground, arcs, controls and receiving apparatus. Determination of most desirable antenna construction is considered and experimental means of measuring antenna height are given. Methods of simplex and duplex operation are discussed. Reception data from four high powered American stations are given.

See also Nauen Station.

Stations, Sending Times of. Schedule of Principal Radiotelegraphic Emissions (Horaire des principales émissions radiotélégraphiques), F. Duroquier. Nature (Paris), no. 2389, Jan. 10, 1920, p. 9. Table giving Greenwich time of day at which each of principal stations of the world send messages, as well as length and character of wave used, and nature of service.

Submarine. Submarine Radio-Telegraphy, H. D. Forest Stevers. Armour Engr., vol. 11, no. 1, Nov. 1919, pp. 12-16. Description of single-turn loop-antenna receiving coils.

Submarines, Equipment of. The Wireless Equipment of Ex-German Submarines, E. Harper. Post Office Elec. Engrs. Jl., vol. 12, no. 3, Oct. 1919, pp. 155-169, 13 figs. System used was "Telefunken," which is a quenched spark system. Power was supplied by motor alternator run from main battery.

Thermionic Valves. See THERMIONIC VALVES.

Time Recording. Recording of Eiffel Tower Time Signals for Determination of Clock Error, L. B. Turner. Elecn., vol. 83, no. 2165, Nov. 14, 1919, pp. 554-557, 8 figs. Wireless recording apparatus intended for use in determinations of longitude for survey work in East Africa.

Towers. See Masts.

Transmitters. Modern Transmitters of Undamped Oscillations in Wireless Telegraphy (Die modernen Sender ungedämpfter Schwingungen in der drahtlosen Telegraphie), H. von Arco. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 6, Nov. 1919, pp. 558-569. It is explained that because of the discontinuity of energy, the amplitudes in damped transmitters are greater than in undamped transmitters with the same antenna action. For undamped transmitters three methods are in use, namely, the high-frequency machine, the arc lamp and the cathode tube. For large stations not used for military purposes, the high-frequency machine is said to be most practicable, whereas for exchange of communications where great distances are not involved, especially by telephony, the tube is used almost altogether.

NSS—The Annapolis Radio Station. Wireless Age, vol. 7, no. 3, Dec. 1919, pp. 10-15, 11 figs. General description of arc radio transmitter.

Some Recent Developments in Radio Transmitters, Morton W. Sterns. Wireless Age, vol. 7, no. 3, Dec. 1919, pp. 17-20, 10 figs. Particulars of buzzer transmitter and emergency radio transmitter.

Stabilizing the Energy Output of Transmitters, Gustave Reuthe. Wireless Age, vol. 7, no. 2, 1919, p. 20. Method utilizes frequency changers by which fundamental frequencies of primary source of alternating current energy is multiplied to obtain frequencies required for radiation.

The Intermediate-Circuit Tube Transmitter (Ueber den Zwischenkreisröhrensender), Kurt Heegner. Archiv für Elektrotechnik, vol. 9, no. 4, Aug. 8, 1920, pp. 127-152, 12 figs. Intermediate tube transmitter originates when a primary circuit incited by an electron relay to undamped oscillations is electromagnetically coupled to a secondary circuit. Reaction which latter exerts on primary circuit is investigated.

The Technical Development of the Vacuum-Tube Transmitter (Technische Entwicklung der Röhrensender), Ludwig Kühn. Jahrbuch des drahtlosen Telegraphie und Telephonie, vol. 14, no. 4, Sept. 1919, pp. 395-419, 18 figs. Details and illustrations of vacuum-tube transmitter designed and developed by the Dr. Erich F. Huth Wireless Telegraphy Co. A report from the Company's laboratory.

See also ELECTRON TUBES, Modulated Waves; Receivers.

Transoceanic. Measurement of the Electromagnetic Field of Waves Received During Trans-Oceanic Radio Transmission, Giancarlo Vallauri. Proc. Inst. of Radio Engrs., vol. 8, no. 4, Aug. 1920, pp. 286-296 and (discussion) pp. 297-298, 2 figs. Experiments are described on determination of electric and magnetic field intensities of waves received at Leghorn, Italy, from Annapolis, Md., transmitting station. Pair of large loops, respectively practically parallel and perpendicular to incoming wave, are used. Incoming signals are received by heterodyne oscillator and amplified. Substitution method is used for measurements, whereby incoming signal is compared to artificial signal produced in non-receptive loop by local oscillator.

Trans-Oceanic Radio Communication, Ernest F. W. Alexanderson. Proc. Inst. of Radio Engrs., vol. 8, no. 4, Aug. 1920, pp. 263-285, 15 figs. Possible limitation in number of long-distance radio sections simultaneously in operation is considered. It is shown how high-speed transmission, improved directional selectivity, and better frequency selectivity would greatly increase number of feasible coexistent stations. Utilization of wave-length band as result of high-speed transmission is discussed in connection with frequency selectivity. 200-kw. alternator station at New Brunswick is described, special mention being made of constant speed regulation system for induction motor drive, functioning of magnetic amplifier, and operation of multiple antenna.

Vacuum Valves. Structure and Operation of the Vacuum Valve, Robert W. A. Brewer. Jl. Electricity, vol. 44, no. 3, Feb. 1, 1920, pp. 102-105, 5 figs. Features upon which uniformity of operation of vacuum valve depends.

Wave Meter. A Pocket Wave Meter (Ein Wellenmesser in Taschenformat), Eugen Nesper. Jahrbuch des drahtlosen Telegraphie und Telephonie, vol. 14, no. 6, Nov. 1919, pp. 624-629, 4 figs. Instrument developed by Lorenz Works in Vienna (type W 50/6000), which fits into two small cases and can be carried in a coat pocket; weight, about 5½ lb.

Waves, Electric. Refraction of Electric Waves, T. L. Eckersley. Radio Rev., vol. 1, no. 9, June 1920, pp. 421-428, 6 figs. Confirmation is presented of existence of systematic bending of rays crossing coast line, and it is shown that this "bending" behaves as if it were due to a "refraction" on account of different wave velocities over sea and land. Further observations are cited establishing this point and agreeing with theory of propagation of electric waves over land given by Zenneck, Hack, Sommerfeld and others.

Weagant Group Frequency Circuit. Weagant "Group Frequency" Circuit. Wireless Age, vol. 7, no. 2, Nov. 1919, pp. 19-20, 2 figs. For detection and amplification of continuous and damped oscillations.

[See also ELECTRIC GENERATORS, A.C., Radio-Frequency; ELECTRIC GENERATORS, D.C., High-Voltage; ELECTROMAGNETIC WAVES; ELECTRIC TUBES; INDUCTANCE COILS, Calculations; RADIO COMMUNICATION; THERMIONIC VALVES; VACUUM TUBES.]

RADIOTELEPHONY

Aeronautical. Telephoning from the Air, Roy J. Heppnerr. Jl. of Electricity, vol. 44, no. 7, April 1, 1920, pp. 307-310, 5 figs. Rapid advance and fundamental principles of operation are recorded by major in aviation section of U. S. Army, who is now chairman of Technical Department of University of California Extension Division.

Aeroplanes. Wireless Telephony on Aeroplanes, C. E. Prince. Jl. Instn. Elec. Engrs., vol. 58, no. 291, May 1920, pp. 377-384 and (discussion) pp. 384-390, 6 figs. Method of Roy. Air Force.

Aircraft, Application to. Duplex Wireless Telephony; Some Experiments on Its Application to Aircraft, P. P. Eckersley. Jl. Instn. Elec. Engrs., vol. 58, no. 293, July 1920, pp. 555-565 and (discussion) pp. 565-571. Experiments on duplex wireless telephony for aircraft carried out at Wireless Experimental Establishment of Royal Air Force.

Developments. The Present Status of Wireless Telephony (Der gegenwärtige Stand des drahtlosen Fernsprechens), C. W. Kollatz. Elektrotechnischer Anzeiger, vol. 36, nos. 146 and 147, Dec. 11 and 13, 1919, pp. 699-700 and 706-708, 10 figs. Description and illustrations of damped and undamped waves and speaking waves; arrangement of a wireless-telephone station, additional apparatus employed, and schematic diagram of a portable station.

High-Power Installation. A High Power Wireless Telephony Installation, Frank P. Swann. Wireless World, vol. 8, no. 3, May 1, 1920, pp. 76-79, 3 figs. Description of apparatus used for the demonstrations in experimental building of Marconi Works at Chelmsford from Feb. 23 to Mar. 6, in which opportunities for observing wireless speech and music were furnished.

Receivers, Galena-Metal. Galena-Metal Telephone Receiver (Sur le récepteur téléphonique autodétecteur pointe-crystal ou pointe-métal), R. Dongier. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 4, July 26, 1920, pp. 238-240. Experimental research is said to have demonstrated that receiver composed of contact between metallic point and galena reproduces human voice faithfully and with remarkable clarity.

Secret. Systematic Deformations of Telephonic Currents. Application to a Process of Secret Telephony (Sur les déformations systematiques des courants téléphoniques. Application à un procédé de téléphone secrète), E. Poirson. Bulletin de la Société française des Électriciens, vol. 10, no. 88, April 1920, pp. 147-161, 7 figs. Current is deformed at sending station by apparatus which inverts it periodically. It is rectified at receiving station by similar apparatus operating in synchronism with apparatus at sending station. Deformation renders current unintelligible in line.

Simultaneous Transmission and Reception. Simultaneous Transmission and Reception in Radio Telephony, Noboru Marumo. Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 199-219, 14 figs. After reviewing methods of duplex radio communications previously proposed, writer describes a divided-branch antenna arrangement with supplementary balancing coil, for this purpose. Theory and mode of adjustment of system are explained. Application of this method in practice to ship-to-shore radiotelephony is analyzed, and reference is made to necessary wire-to-radio and reverse transfers.

Transmitters. The Mean Frequency Phenomena in Radio Sound Transmitters (Ueber die mittelfrequenten Vorgänge in Tonfunkensendern), F. F. Martens and G. Zickner. Jahrbuch für drahtlose Telegraphie u. Telephonie, vol. 15, no. 4, Apr. 1920, pp. 266-288, 12 figs. It is shown how a tone frequency of 500 can be entirely eliminated, thus facilitating the adjustment at a frequency of 1000. Suggests an improvement of the mean-frequency apparatus which can be applied to any ordinary apparatus. Bibliography.

25-Mile Radiophone Transmitter Using Marconi V.T.'s for 200-Meter Amateur Work, Chas. R. Leutz. Wireless Age, vol. 7, no. 7, April 1920, pp. 15-18, 9 figs. Description of construction and adjustment of radiophone transmitter.

Vacuum Tubes in. See VACUUM TUBES, Radiotelephonic Uses.

[See also RADIO COMMUNICATION.]

RADIUM

Chemical Action of Radiations. Chemical Action of Radiation (Les actions chimiques du rayonnement), Eugene Wourtzel. Le Radium, vol. 11, no. 11-12, Nov.-Dec. 1919, pp. 332-347, 3 figs. Experiments with H_2 S, NH_3, N_2O, and CO_2.

Electrons and. See ELECTRONS, Radium and.

Production. Radium in 1918, Robert M. Keeney. Min. and Eng. Rec., vol. 24, no. 21, Nov. 15, 1919, pp. 345-347. Production, metallurgy and uses.

See also MANGANESE, Production in 1919; MINERALS, Production in U. S.

Radium: Uranium Ratio. New Determination of the Absolute Value of the Radium: Uranium Ratio, S. C. Lind and L. D. Roberts. Jl. Am. Chem. Soc., vol. 42, no. 6, June 1920, pp. 1170-1177. Value given as average of 18 determination is 0.00000034.

Uranium and. The Relation between Uranium and Radium, Frederick Soddy. London. Edinburgh and Dublin Phil. Mag., vol. 38, no. 226, Oct. 1919, pp. 483-488, 2 figs. Growth of radium in uranium purified initially from ionium and radium is calculated to proceed regularly according to square of time with period 237,500,000 years as product of periods of average life of ionium and radium.

The Relative Activity of Radium and the Uranium with Which It Is in Radioactive Equilibrium, J. H. L. Johnstone and B. B. Boltwood. Lond., Edinburgh, and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 235, July 1920, pp. 50-67, 2 figs. Results obtained from redetermination indicate that if activity of uranium is taken as unity the activity of radium is equal to approximately 0.49. Total activity of uranium mixed with equilibrium quantities of its disintegration products has been compared with activity of uranium alone, and former has been found to be 4.73 times latter.

[See also ELECTRONS.]

RAILLESS TRACTION

Electric. The Possibilities of Railless Electric Traction, R. H. Wilkinson. Tramway and Ry. World, vol. 48, no. 3, July 15, 1920, pp. 12-13. Railless vehicles have been in operation in England for 9 years and writer believes there will be considerable extension in their use.

Tees-Side. The Tees-Side Railless Traction System, Wm. Porritt Ingham. Tramway & Ry. World, vol. 46, no. 30, Dec. 18, 1919, pp. 331-336, 10 figs. Construction of system of double trolley used for operation of electric trucks at North Ormesby, South Bank, Normanby and Grangetown. Comparison of operation with that of gasoline propelled vehicles.

RAILROADS

See RAILWAYS.

RAILS

Basic Open-Hearth Steel. Basic Open-Hearth Steel Rails, Cecil J. Allen. Ry. Engr., vol. 41, no. 485, June 1920, pp. 243-245. Notes on their composition and properties and discussion on analysis of various casts.

Report of Committee IV—On Rail. Bul. Am. Ry. Eng. Assn., vol. 21, no. 225, March 1920, pp. 225-266, 19 figs. Also in Ry. Age, vol. 68, no. 12a, Mar. 19, 1920, pp. 1000-1005. Specifications for carbon-steel rails are formulated. One appendix enumerates results of experiments made to determine nature of defects revealed by deep etching of transversely fissured rails, and another discusses brittleness in steel rails.

Defects. See Transverse Fissures.

Economic Weights. Economic Weights of Rails. Ry. Maintenance Engr., vol. 16, no. 10, Oct. 1920, pp. 386-389, 3 figs. Attempt is made to develop a method by means of which the economic weight of rail for various classes of traffic may be determined. Report of committee before Roadmasters & Maintenance of Way Assn.

Electric Welding. See ELECTRIC WELDING, ARC, Rails.

Failures. Report of Accident Rail Failure. Railroad Herald, vol. 24, no. 7, June 1920, pp. 27-32, 3 figs. From report of chief of Bur. of Safety covering investigation of accident which occurred on Chesapeake & Ohio Ry. near Hardware, Va., caused by a broken rail. Investigation to determine reason for failure of rail was conducted by James E. Howard, engineer-physicist, whose report is given.

Studying Failure of Steel Rails, James E. Howard. Iron Trade Rev., vol. 67, no. 1, July 1, 1920, pp. 25-27, 6 figs. Shattered zones were found along middle of head and at junction of web and base and are thought to form after last passing of rolls. Cold-rolling action of wheels. Paper read before Am. Soc. for Testing Materials.

Fissured. See Transverse Fissures.

Fracture. One of the Causes of Rail Fracture, and a Way of Preventing It, Georges Charpy and Jean Durand. Bul. Int. Ry. Assn., vol. 2, No. 1-2-3, Jan.-Feb.-March 1920, pp. 45-48, 5 figs. Fine cracks which are formed in course of time on rolling surface of rails are attributed, as result of experimental investigation, to intense crushing to which superficial layer of rail is subjected. This phenomenon is said to be common to other objects, such as chains, bolts, stays, etc. It is said that this effect can be counteracted by annealing treatment applied to surface at suitable intervals. Translated from Comptes rendus des Séances de l'Académie des Sciences.

Pressures on. Intensity of Pressure on Rails, J. R. Onderdonk. Bul. Am. Ry. Eng. Assn., vol. 21, no. 218, Aug. 1919, pp. 49-87, 42 figs., partly on three supp. plates. Report of Sub-Committee on Rational Relation between intensity of pressure due to wheel loads and resistance of rail steel to crushing and deformation.

Rolling. See ROLLING MILLS, Rail Rolling.

Rupture. Cause of Rupture of Rails at Fish Joints (Cause de la fréquence des ruptures de rails dans leurs extrémités éclissees), Charles Frémont. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 6, Aug. 9, 1920, pp. 341-342. Discontinuity of rail at joint constitutes point of less resistance and, for a given load, occasions elastic flexure greater than at any other point. Hence greater bending and stresses in rail unequally distributed throughout mass.

Street-Railway. See STREET RAILWAYS, Rails, French Standard.

Testing Machines for. British Standard Specification for Falling Weight Testing Machines for Rails. British Eng. Standards Assn., no. 103, June 1919, 1 p.

Titanium-Treated. Service Results with Titanium-Treated Rail. Ry. Maintenance Engr., vol. 16, no. 5, May 1920, pp. 197-198. Statistics showing that failures for titanium-treated open-hearth steel rails in service have been 48 per cent of average for untreated open-hearth, and those for titanium-treated bessemer only 21 per cent of those for untreated bessemer. From Bul. 81 of Rail Committee of Am. Ry. Eng. Assn.

Transverse Fissures. Examination of Rails Long in Service for Relation Between Internal Stresses and Strains and Transverse Fissures, W. C. Cushing. Bul. Am. Ry. Eng. Assn., vol. 21, no. 218, Aug. 1919, pp. 95-124, 31 figs. Account of mechanical, chemical and microscopical examinations at Altoona Lab. of Pa. Railroad.

Metallographic Features Revealed by the Deep Etching of Steel, H. S. Rawdon and Samuel Epstein. Tech. Papers Bur. Standards, no. 156, March 19, 1920, 24 pp., 15 figs. It is argued from results of experiments that gash defects found in rails in which transverse fissures have developed and in similar materials, are physical discontinuities or internal fractures which exist within material previously to etching, etching merely revealing defect. A magnetic method for locating such defects in unetched specimens is described.

Relationship between Transverse Rail Fissures, Flakes and Defects in Fusion Welds, S. W. Miller. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 729-733, 18 figs. Examination of defective rail and gun steel under strain leads to conclusion that rail fissures, flakes and defects in fusion welds are all due to films of oxides between metallic grains.

Transverse Fissure Rails on Atchison, Topeka & Santa Fe Railroad—Heat 41177, M. H. Wickhorst. Bul. Am. Ry. Eng., Assn., vol. 21, no. 218, Aug. 1919, pp. 1-19, 16 figs. Investigation made of 52 rails of one heat, one of which failed due to transverse fissures and derailed train. Investigation disclosed that metal in interior of head of several rails was in badly shattered condition, containing numerous cracks, a few of these acting as nuclei from which transverse fissures developed in service.

Wear. Cause of Undulatory Wear of Rails (Cause de l'usure ondulatoire des rails), Ch. Frémont. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 14, Apr. 6, 1920, pp. 837-838. Explanation given is as follows: When a wheel slides on rail, axle of wheel is strained by resisting torque; when wheel comes to sudden stop energy of torsion in axle is suddenly released and wheel is caused to rotate slightly in opposite direction, thus grinding rail.

What Makes the Rails Wear Out? R. C. Cram. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 149-154, 14 figs. Diagrams are given which show that car traffic is not wholly responsible for wear but that vehicles take large toll from rail heads.

See also RAILWAY TRACK, Rail Wear.

Wear Measurement. An Instrument for Measurement of Rail Wear, Alexander D. Ferguson. Jl. Eng. Inst. Can., vol. 3, no. 1, Jan. 1920, pp. 8-9, 6 figs. Describes instrument which, in writer's belief, is invaluable as it obviates any use of age-life basis for track depreciation.

Welding. See OXY-ACETYLENE WELDING, Rails.

RAILWAY ARTILLERY

See ARTILLERY, Railway.

RAILWAY CONSTRUCTION

Africa. Notes on Railway Construction in Uganda. Ry. Engr., vol. 41, no. 480, Jan. 1920, pp. 5-12, 10 figs. How grades were reduced in section where difference in level is 7758 ft. and where ravines scoring sides of steep scarp could not be crossed by ordinary embankments.

Big Four R.R. Chicago-Indianapolis Improvement Big Four Railroad. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 606-607, 1 fig. Grade reduction and double-tracking program to reduce time for heavier trains. Short cut-off costs $1,000,000.

Grade Crossings. See GRADE CROSSINGS.

India. Submergence of Culturable Land by Railway Embankments, R. Egerton Purves. Indian Eng., vol. 66, no. 15, Oct. 11, 1919, pp. 206-207, 1 fig., on supp. plate. Calculations of submergence due to embankment of Mailani-Dudwa Branch, Rohilkund-Kumaon Ry. across Sarda Valley in vicinity of Palia Kalan, Tehsil Nighasan, District Kheri, Oudh, presented as typical of this class of works.

Industrial Line. Location and Structures of a Heavy Industrial Railway. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 604-612, 12 figs. Details of railroad built for hauling coke made at a by-product plant to a glass furnace in Monongahela Valley. Line is double-tracked and five miles long.

New York Central. New York Central Railroad Accommodates Itself to Construction of Barge Canal, B. S. Voorhees. Eng. News-Rec., vol. 84, no. 11, March 11, 1920, pp. 500-506, 8 figs. Construction details of new bridge, rebuilding and relocation necessitated by contiguity of new state waterway with chief rail route.

New York Central Relocates Line in Tonawanda, N. Y. Ry. Age, vol. 68, no. 5, Jan. 30, 1920, pp. 347-350, 9 figs. Work involved construction of double-track roadbed approximately two miles long with 11 concrete and steel structures carrying new line over streets, 200-ft. fixed truss bridge, bascule lift span, 3500 ft. of new streets, 2500 ft. of retaining walls and layouts for passenger and freight stations.

Reinforced Concrete, Uses of. Note on the Use of Reinforced Concrete in England for Railway Work, Other Than Bridges and Building, L. Weissenbruch. Bul. Int. Ry. Assn., vol. 1, no. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 207-237, 35 figs. Examples are shown of applications of reinforced concrete in construction of signal masts and telegraph poles; fencing; supports for pulleys; cranks, compensators; electric conduits; lamp-posts, etc.; and sleepers for sidings and inspection pits.

RAILWAY ELECTRIFICATION

Australia. Railway Electrification in Australia. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 631-638, 10 figs. Upwards of 200 miles of line have been electrified in carrying out scheme ultimately intended to cover entire system of state-owned lines as well as to concentrate in one large project greater portion of power development needed by industries of Commonwealth.

See also Melbourne.

Belgium. The Electrification of the Belgian State Railways. Ry. Gaz., vol. 33, no. 2, July 9, 1920, pp. 55-56. Outline of scheme. Proposed routes and anticipated operating advantages and estimated savings.

Canada. See Grand Trunk Ry.

Chicago, Milwaukee & St. Paul Ry. Chicago, Milwaukee & St. Paul Railway Completes Electrification of Pacific Coast Division, W. A. Scott. Elec. Rev. (Chicago), vol. 76, no. 12, Mar. 20, 1920, pp. 496-497, 8 figs. General features of generating stations.

Electric Power Consumption on the Rocky Mountain and Missoula Divisions of the C., M. & St. P. Rwy., Reinier Beeuwkes. Gen. Elec. Rev., vol. 23, no. 9, Sept. 1920, pp. 724-730, 5 figs. Operating statistics for 1919. Cost per actual kilowatt-hours delivered to locomotives is given as 1.1 cents.

Holding Down Load Peaks on the St. Paul, J. J. Linebaugh. Elec. Ry. Jl., vol. 55, no. 15, Apr. 10, 1920, pp. 759-761, 4 figs. Description of an apparatus built, installed and tried out on the 220-mile Rocky Mountain Division, now supplied to Missoula Division, with which load factor of nearly 60 per cent is said to be obtained.

Substantial Switching Equipment of the Chicago, Milwaukee & St. Paul Railroad, C. M. McL. Moss. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 15-18, 8 figs. Line comes into station through 110,000-volt, hand-operated, remote-mechanically-controlled oil circuit breakers, and from thence passes to station bus.

The Electric Power Supply for the Puget Sound Lines of the Chicago, Milwaukee & St. Paul Railroad, A. W. Copley. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 3-9, 16 figs. Schematic diagram of substations and transmission lines, together with details of connections between 63,000-volt system of Washington Water Power Co. and 110,000-volt feeders at Long Lake.

3000 Volt Motor-Generator Sets for the Chicago, Milwaukee & St. Paul Railroad, David Hall. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 12-15, 9 figs. Each set consists of 2800-hp., 3-phase, 60-cycle, 2300-volt, 514 r.p.m. synchronous motor which drives two direct-current, 1500-volt, shunt-wound, commutating-pole, compensated generators, armatures of which are connected in series to give 3000 volts.

Transformer Equipment for the Chicago, Milwaukee & St. Paul Installation, Walter M. Dann. Elec. Jl., vol. 17, no. 1, Jan. 1920, pp. 9-11, 6 figs. Each motor generator set, with its motor rated at 2420 kv-a., is fed by its own 3-phase transformer, making complete transforming unit from 100,000-volt lines to 3000-volt d.c. circuits.

D. C. Transmission System. Direct Current Transmission for Electrification, Alfred Raworth. Ry. Age, vol. 68, no. 2, Jan. 9, 1920, pp. 179-180, 1 fig. Proposed system would deliver 3000-volt d.c. power from conductor rails to multiple-unit trains.

England. Lancashire & Yorkshire Railway. English Elec. Jl., vol. 1, no. 1, Jan. 1920, pp. 12-20, 10 figs. Review of growth of electrification in England.

The Ealing and Shepherd's Bush Railway. Ry. Engr., vol. 41, no. 488, Sept. 1920, pp. 380-382, 5 figs. New electrified section of Great Western Railway furnishes an additional through route between Ealing and Liverpool Street via Wood Lane and Central London Railway.

See also London & N. W. Ry.

Equipment Repairs. Equipment Repairs on Long Island Railroad. Elec. Ry. Jl., vol. 55, no. 23, June 5, 1920, pp. 1136-1146, 12 figs. Account of improvements in methods and organization during 15 years' experience in maintenance of heavy electric-railway rolling stock. Includes table giving list of rolling stock which L. I. R. R. now has in service on its electrified division.

Erie R. R. Single Phase Electrification on the

Erie. Q. W. Hershey. Ry. Rev., vol. 67, no. 15, Oct. 9, 1920, pp. 540-542, 3 figs. Account of electrification of 37-mile branch of Erie Railroad in Genesee valley, south of Rochester, N. Y.

France. Electrification of the French Railways (L'électrification des chemins de fer français). Vie Technique et Industrielle, vol. 1, no. 10, July 1920, pp. 307-310, 8 figs. Project for electrification of 1838 miles of the Southern Ry. of France and 1900 miles of Paris-Orleans Ry.

Railway Electrification (L'électrification des chemins de fer). Industrie des tramways et Chemins de Fer, vol. 13, nos. 151-152-153, July-Aug.-Sept. 1919, pp. 84-88, 4 figs. Report submitted by commission sent to America by French Ministry of Public Works.

The Harnessing of the Dordogne River and the Electrification of the Orléans Railway (L'aménagement hydraulique du bassin de la Dordogne et l'électrification du réseau de la Compagnie du Chemin de fer d'Orléans), G. Tochon. Génie Civil, vol. 77, no. 10, Sept. 4, 1920, pp. 190-193, 2 figs. Projected hydroelectric plants.

Future Development. The Last Stand of the Reciprocating Steam Engine, A. H. Armstrong. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 209-218, 11 figs. Reliability and permanency of electric-locomotive haulage, it is pointed out, are sufficiently demonstrated by results of several years' operation to justify prediction that developments in future will tend toward railway electrification. Changes which the general introduction of electric locomotive will permit in method of hauling freight and passenger trains are visualized.

Grand Trunk Ry. Result of Twelve Years' Heavy Haulage, R. L. Hermann. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 480-482. Average cost of maintenance of electric locomotive equipment, material and labor up to Dec. 1914 was 4.514 cents per locomotive-mile, and from Dec. 1914 to Dec. 1919, 7.051 cents per locomotive-mile.

Maintenance. Electric Operation on the B., A. & P., F. W. Bellinger. Elec. Ry. Jl., vol. 55, no. 22, May 29, 1920, pp. 1101-1102. Maintenance costs of Butte, Anaconda & Pacific Railway which has been electrified for seven years.

Melbourne. Electrification of Melbourne Suburban Railways. Elecn., vol. 32, no. 1, Jan. 2, 1920, pp. 12-20, 3 figs. Also Ry. Gaz., vol. 32, no. 1, Jan. 2, 1920, pp. 12-20, 12 figs. Leading engineering features are production of electric power at 3300 volts, between phases, by means of three-phase, 25-cycle, turbine-driven alternators, raised to 20,000 volts by static transformers, its transmission at this pressure to substations where it is converted to 1500 volts direct current, and supply to trains at this pressure by means of overhead contact wire.

Melbourne Suburban Railways Electrified. Elec. Ry. Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 902-906, 11 figs. Direct-current 1500-volt system with overhead trolley is employed. Notably different from American practice is large number of units of smaller capacity in station, where there are six steam turbines coupled to generating units of only 10,000 kw. normal rated capacity.

Melbourne Suburban Electrification, Australia, W. D. Bearce. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 662-668, 12 figs. High-voltage, direct-current equipment is used. Enterprise involved electrification of 336 single-track miles, equipping of 400 motor cars and 400 trailer cars and installation of 15 substations having total ultimate capacity of 81,000 kw.

The Melbourne Suburban Railway Electrification. Engineering, vol. 109, no. 2819, Jan. 9, 1920, pp. 40-46, 10 figs.

Mine Railways. Electric Operations—Butte, Anaconda & Pacific, F. W. Bellinger. Ry. Age, vol. 65, no. 24, June 11, 1920, pp. 1657-1658, 2 figs. The capacity of the Smelter Hill line is said to have been increased 108 per cent since road was electrified.

Necessity of. Why Electrification Is an Economic Necessity, A. H. Armstrong. Elec. Ry. Jl., vol. 55, no. 8, Feb. 21, 1920, pp. 373-379, 4 figs. High load factor, fuel economy and service capacity of electric-locomotive equipment are quoted as salient factors in making reasonably rapid replacement of steam locomotives an economic necessity. Paper read before Schenectady section of Am. Inst. E. E.

Plea for. Economical Power: The Strongest Agent for Maintaining Supremacy in World's Trade, W. S. Murray. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 27-31 and (discussion) pp. 31-33. Plea for electrification of railways and utilization of available water power.

Prussian Railways. Electrification of the Prussian Railways in Silesia. Elec. Ry. Jl., vol. 56, no. 11, Sept. 11, 1920, pp. 499-502, 8 figs. Single-phase power with 15,000 volts on contact line is used. Interconnected water-power plants with steam auxiliary furnish power. Several types of locomotive are required to cover all classes of requirements. From article by E. C. Zehme in Elektrotechnische Zeitschrift.

Regenerative Braking. Electrification of Railroads (Electrificacion de vias férreas), Cesar A. Cipriani. Informaciones y Memorias de la Sociedad de Ingenieros del Peru, vol. 21, no. 10, Oct. 1919, pp. 465-477. Economical significance of introducing regenerative brakes.

Remote Control of Substations. The Power Indicating and Limiting Apparatus for the Chicago, Milwaukee & St. Paul Railroad, B. H. Smith. Elec. Jl., vol. 17, no. 2, Feb. 1920, pp. 42-46, 10 figs. Method of transmitting meter indications by using frequency as indicator of power. This method was developed by disturbances resulting in copper pilot line by reason of excessive dampness in weather of Coast Division.

Side-Contact Design. New Side Contact Design for Railway Electrification, E. Goolding. Tramway & Ry. World, vol. 46, no. 24, Nov. 13, 1919, pp. 273-275, 1 fig. Designed with a view to provide complete protection to live parts, free drainage, straight board protection with movable clamps and room for anchoring and cable connections.

South Africa. Electrification of the South African Railways, Robert E. Thayer. Ry. Age, vol. 67, no. 22, Nov. 28, 1919, pp. 1051-1055, 3 figs. Report of London consulting engineers for electrification of 860 route miles. Electric freight locomotives weighing 268,800 lb. having tractive effort of 48,000 lb. for 1 hr. and 64,000 lb. for short periods are recommended.

Statistics. The Use of Electrical Energy on the Railroads. Ry. Elec. Engr., vol. 10, no. 12, Dec. 1919, pp. 419-430, 4 figs. Statistics of electrification of steam railroads in 1919, and notes on application of electrical automechanical freight handling, together with review of recent uses of electric welding for repairing of locomotives.

Sweden. Electric Railway Service on 130-km. Stretch of the Swedish State Railroad (Elektrische Zugförderung auf der Strecke Kiruna-Rigsgränsen der schwedischen Staatsbahn), H. Winkler. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 8, Feb. 21, 1920, pp. 181-185, 12 figs. Increase in efficiency of 40

per cent is claimed due to electrification of line, the current of which is generated by water power. Notes on the 50-m. underground power plant, the 80,000-volt long-distance line, the 15,000-volt overhead line, etc. Experiences of first four years of operation are reviewed.

Switzerland. Swiss State Railways Electrification. Elec. Ry. & Tramway Jl., vol. 42, no. 1029, June 11, 1920, pp. 225-228, 9 figs. St. Gothard section partly completed. Details of the Ritom power station utilizing Foss torrent from Ritom lake, provision being made for taking water at 30 m. below actual surface level. Electric locomotives have continuous power of 2400 hp., and total weight for direct trains of 107.6 tons and for goods trains of 121 tons.

The Electrification of the Rhaetian Railway (Von der Elektrifizierung der Rhätischen Bahn), H. Lang. Schweizerische Bauzeitung, vol. 75, no. 20, May 15, 1920, pp. 217-220, 19 figs. Details of the electric equipment of the section Bevers-Filisur-Thusis (length, 54,415 km. including 15,868 km. tunnel) and section Filisur-Davos (length, 21,944 km. including 4212 km. tunnel). Main data are: Gage, 1 m.; maximum ascent, 35 deg.; smallest curve radius on open road, 100 m.; maximum speed, 45 km. per hr.; maximum height of trolley wire above rails on open road, 5200 mm., and in tunnel 4150 mm.; cost of construction, 64,000 Fr. per km.

United States. The Prospects of Railroad Electrification in America and Abroad. Street Ry. Bul., vol. 19, no. 11, Nov. 1919, pp. 427-429. High cost and inadequate supply of fuel in Europe make, in opinion of writer, railroad electrification there inevitable.

RAILWAY MAINTENANCE

Air-Brake Equipment. Maintenance of Air Brake and Safety Car Control Equipment, Joseph C. McCune. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 537-543, 21 figs. Emphasizes that inspection methods should be so thorough that remotest failures will be guarded against and prevented and tests should be simple but accurate.

Car Inspection. Basing Car Inspection on Energy Consumption, L. E. Gould. Elec. Traction, vol. 16, no. 8, Aug. 1920, pp. 557-559, 1 fig. Method is said to insure that each car will be uniformly announced for inspection when it has done requisite amount of work to require it.

The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, nos. 6 and 9, June and Sept. 1920, pp. 369-373 and 587-588. June: Maintenance of trucks, lubrication and packing of journal boxes, defects of wheels and axles. Sept.: Handling weak and defective cars; preparing equipment for refrigerator and heater service.

Rolling Stock. Railroads Need Modern Machine Tools, Roy V. Wright. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 359-362, 3 figs. It is urged that more critical and scientific attention be given to upkeep of cars and locomotives. Address given before Nat. Machine Tool Builders' Assn.

RAILWAY MANAGEMENT

Accounting. Accounting of Railway Goods Traffic, L. C. Webber Reed. Ry. Gaz., vol. 31, no. 21, Nov. 21, 1919, pp. 665-666. Suggests that forwarding of all goods traffic "carriage paid" would avoid necessity of abstracting, simplify accounts, and produce great economies.

Cost Accounting. See COST ACCOUNTING, Railway.

Freight-Traffic Increase. Chicago Roads Increase Freight Traffic. Elec. Traction, vol. 16, no. 2, Feb. 1920, pp. 87-91, 5 figs. How freight traffic has been increased by giving service in coöperation with electric railways.

Pennsylvania Regional Organization. The New Pennsylvania Regional Organization. Ry. Age. vol. 68, no. 12, Mar. 19, 1920, pp. 965-968, 6 figs. Four regions are bound together by departmental organization permitting centralized authority and expert supervision.

Suggested Reorganization Plan. The Railway Problem, Charles Whiting Baker. Eng. News-Rec., vol. 83, nos. 17 and 18, Oct. 23 and 30, 1919, pp. 752-758 and 789-796. Suggests organization of railway corporations under Federal charters, all profits above fair return on capital to be invested for public benefit, to supply need for new railway capital and amortize existing capital.

RAILWAY MOTOR CARS

Converted Motor Trucks. Solving the Problems of the Railway Motor Car, Donald A. Hampson. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 21-25, 4 figs. Mathematical study of possibilities and limitations of motor truck when converted to railway use.

Gasoline. New Gasoline Motor Car for Hetch Hetchy Railroad. Elec. Ry. Jl., vol. 55, no. 9, Feb. 28, 1920, pp. 428-429. Car is equipped with 38-hp. motor which, with standard gear reduction at differential is said to furnish sufficient power to readily operate over grade as high as 4 per cent on direct drive.

Possibilities of. Problems Presented in the Operation of the Railway Motor Car, Donald A. Hampson. Automotive Industries, vol. 42, no. 23, June 3, 1920, pp. 1256-1260, 9 figs. Deals with some of chief difficulties in problems of construction and operation, and points the way out. Discusses acceleration and deceleration, with summary of possibilities.

See also MOTOR CARS, Electric.

RAILWAY OPERATION

Accident Prevention. See ACCIDENT PREVENTION, Railway Work.

Automatic Train Control. Automatic Signals and Train Stops, C. C. Anthony. Proc. Pacific Ry. Club, vol. 3, no. 8, Nov. 1919, pp. 2-8. Opinion is given that automatic train stop as it is now developed can be applied to railroads and used in connection with signal system, so that operation of trains will not be seriously interfered with and safety of operation will be decidedly increased.

Automatic Train Control, F. F. Bostwick. Proc. Pacific Ry. Club, vol. 3, no. 8, Nov. 1919, pp. 9-19, 7 figs. Historical survey of development of automatic-stop devices.

Automatic Train Control Committee Makes Report. Ry. Age, vol. 68, no. 3, Jan. 16, 1920, pp. 227-232. Committee concluded that relative merits of various types of automatic train control cannot be determined until further tests have been made; more extended service tests including complete records of performance, are particularly recommended.

Regan Automatic Train Control System C. R. I. & P. Ry. Ry. Rev., vol. 66, no. 18, May 1, 1920, pp. 720-723, 6 figs. System is of intermittent contact type and is designed to carry continuous speed control through caution territory. It embraces both automatic speed control and automatic stop features.

The Automatic Train Control Problem, H. S. Balliet. N. Y. R. R. Club, Official Proc., vol. 30, no. 5, Mar. 19, 1920, pp. 6018-6022 and (discussion) pp. 6022-6062, 1 fig. Problem is said to comprise two main elements: (1) Reproducing upon a moving train, either by mechanical or electrical means, a correct indica-

tion of condition of track ahead; proper means for controlling train in obedience to indication given.

Car Loading, Nominated. Nominated Loading. Ry. Gaz., vol. 32, no. 8, Feb. 20, 1920, pp. 267-268. Describes new system of handling "smalls" traffic, showing its origin, development, advantage to traders, and its influence in removing congestion at transshipping stations.

Car Records. Car Records and Their Relation to Transportation and Car Accounting, J. D. Altimas. Can. Ry. & Marine World, no. 272, Oct. 1920. pp. 535-537. Paper read before Can. Ry. Club.

Economics. The Transportation Engineer and Railway Economics. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, p. 693. New position suggested to insure broader views of operating problems and their economic relations.

Freight Handling. Electric Automechanical Handling of Freight Shipments, Zenas W. Carter. Elec. Rev., vol. 75, no. 23, Dec. 6, 1919, pp. 939-941. Proposed central freight station for London using Gattie system.

Freight Handling on the Scioto Valley Railway. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 746-750, 14 figs. Methods employed in order to meet sudden rush of freight business due to establishment of war camp on line.

The Flow of Freight Through Transit Sheds, H. McL. Harding. Eng. World, vol. 17, no. 1, July 1920, pp. 9-10. It is emphasized that a constant flow of freight should be maintained by relieving floor congestion by overhead cranes, tractors and trailer hoists, especially for transverse movements and for assorting, distributing and tiering, and using surface tractors and trailers for longitudinal movements beyond range of crane hooks.

See also FREIGHT HANDLING.

Freight Traffic, Classification of. Freight Train Operating—The Maximum Load. Ry. Gaz., vol. 32, no. 5, Jan. 30, 1920, pp. 145-147. Describes methods of classifying freight traffic for operating purposes on Great Western Ry. Three fundamental and basic principles laid down by Great Western are (1) classification of traffic (weight to be hauled); (2) classification of engines (tractive force to be used), and (3) haulage capacity of engines in each group according to gradient.

Freight-Train Loading Method. A Practical Freight Train Loading Method, R. S. Mounce. Ry. Mech. Eng., vol. 94, no. 5, May 1920, pp. 270-274, 5 figs. Method is outlined for finding car factor and equated loading for any given condition. Basis of method is standard loading chart for 10,000-lb. available tractive effort at speeds between 5 and 12 m.p.h. under various weather conditions.

Freight-Train Loads. The Economics of the Freight Train Load, Wm. J. Cunningham. New England Railroad Club, Apr. 13, 1920, pp. 73-89 and (discussion), pp. 89-106. Also in Ry. Rev., vol. 67, no. 2, July 10, 1920, pp. 42-45. Theoretical manner of computing theoretical train load on grade of specified rate at specified speed under normal conditions for locomotive of given characteristics and train made up of cars of given average weight, is exemplified.

Heavy-Tonnage Trains. Handling Heavy Tonnage Trains. Southern & Southwestern Ry. Club, vol. 15, no. 6; Nov. 1919, pp. 6-42, 14 figs. Economical advantages of handling heavy-tonnage trains are pointed out. It is particularly emphasized that bituminous and other coal traffic can take lower freight rate by being handled in heavy-tonnage trains.

New Routes. Note on the Formulæ of Operation of Local Railways, Tramways and Automobile Transportation Services. (Note au sujet des formules d'exploitation des chemins de fer d'intérêt local, des tramways et des services de transports automobiles), M. Dutaret. Annales des Ponts et Chaussées, vol. 53, no. 6, Nov.-Dec. 1919, pp. 406-413, 1 fig. Concerning economical establishment of new routes.

Outlying Switches. Centralizing the Operation of Outlying Switches, J. E. Saunders. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 621-622. It is argued that remote control of switches means increased track capacity, safety and economy in train service.

Passenger Traffic. The Regulation of High-Density Passenger Traffic. Ry. Gaz., vol. 33, no. 1, July 4, 1920, pp. 9-24, 19 figs. and map on supp. page. Method of Lancashire & Yorkshire Ry. Co. for regulating heavy seasonal passenger traffic to Lancashire Coast resorts by scientific scheme of advance booking of travel. Scheme, it is explained, insures comfort of passengers, facilitates traffic arrangements, and effects economies in engine power, trainmen's wages and station staff.

Pennsylvania R. R. The New Zone Operating Plan of the Pennsylvania Railroad, Theodore E. Ash. Transportation World, April 1920, pp. 14-16. System has been divided into four regions, with each region in charge of a vice-president.

Signal Indications. Train Operation by Signal Indication, Henry M. Sperry. Ry. Age, vol. 68, nos. 23 and 24, June 4 and 11, 1920, pp. 1553-1558 and 1669-1674, 10 figs. Also in Ry. Signal Engr., vol. 13, no. 5, May 1920, pp. 208-210, 6 figs. June 4: Discussion of two principal methods of directing train movements —time interval and space interval. June 11: Comparative effectiveness of railway operation by train orders and by signal indication is discussed. Signal indication is preferred principally because necessary lapse of time between receipt and execution of train order is considered as element of weakness which does not exist in the case of operation by signals.

Single-Track. Single Track Operation Without Train Orders, F. H. Bagley. Ry. Age, vol. 68, no. 16, Apr. 16, 1920, pp. 1205-1206, 2 figs. Busy stretch operated by signal indication by installation of traffic locking scheme.

Speed Control. Rock Island Installs Speed Control and Train Stop. Ry. Signal Engr., vol. 13, no. 5, May 1920, pp. 204-206, 5 figs. Three-position relay repeats signal indications. Passing of caution signals restricts speed.

Telegraph vs. Telephone. The Telegraph and Telephone for Train Orders. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 375-379. Interstate Commerce Commission statistics show that telephone is replacing telegraph.

Train Control. See Automatic Train Control.

Train Dispatching. Development of Train Despatching by Telephone, Stanley Rhoads. Ry. Signal Engr., vol. 13, no. 1, Jan. 1920, pp. 11-13, 2 figs. Notes that progress made in recent years permits use of sets on longer circuits with all stations cut in.

Wireless Train Communication. See RADIOTELEGRAPHY, Railway Train Communication.

Wrecks, Handling. See CARS, TANKS, Wrecks, and Derailment.

[See also RADIOTELEGRAPHY, Railway Trains; SAFETY DEVICES, Railway Operation; SNOW PLOWS.]

RAILWAY REPAIR SHOPS

Electric Welding in. See ELECTRIC WELDING, ARC, Railway Repair Shops.

Great Western Railway, England. Locomotive Building and Repair Operations at Swindon

Works, Great Western Railway. Ry. Gaz., vol. 33, no. 11, Sept. 10, 1920, pp. 330-334, 8 figs. Methods employed for boiler and firebox work.

Illinois Central, Methods of. McComb Shops of Illinois Central, James F. Hobart. Boiler Maker, vol. 20, no. 3, Mar. 1920, pp. 64-67, 4 figs. Attention is directed to methods of storing new and old material, welding plant and efficiency practices.

Layout. Modernizing Freight Car Repair Facilities, Gustave E. Lemmerich. Ry. Rev., vol. 66, no. 10, Mar. 6, 1920, pp. 375-380, 6 figs. Also Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 143-148, 6 figs. Survey is presented of existing freight-car situation showing that demand for near future is certain to be much in excess of supply. Writer argues for more general rehabilitation of equipment already on hand and submits proposal for freight-car repair plant and discusses its several features in detail.

Report of Committee on Repair Shop Layouts. Ry. Age, Daily Edition, vol. 68, no. 24, June 15, 1920, pp. 1801-1806, 3 figs. Scheme recommended by Committee of Am. Railroad Assn., Mech. Section.

Union Pacific. Union Pacific Shops at Cheyenne, Wyo., E. A. Hancock. Ry. Rev., vol. 66, no. 4, Jan. 24, 1920, pp. 127-129, 3 figs. Plant for general repairs to engines operating in mountain territory. Erecting shop is of transverse type and is fitted with high-powered cranes.

RAILWAY SHOPS

Blacksmith Shops. Modern Requirements in a Railroad Blacksmith Shop. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 595-596. Concerning size, removal of smoke and gases, and fuel to be used. Paper read before International Ry. Master Blacksmiths' Assn.

Drop Tables, Electric. Electric Drop Tables, Phila. & Reading R. R. Ry. Rev., vol. 66, no. 2, Jan. 10, 1920, pp. 47-49, 5 figs. Time-saving scheme for removal and replacement of truck and driving wheels.

Machine Tools for. See MACHINE TOOLS, Railway-Shop.

Management. See INDUSTRIAL MANAGEMENT, Railway Shops.

Repair Shops. See RAILWAY REPAIR SHOPS.

Stores Management. Management of a Railroad Stores Department, E. H. Polk. Ry. Rev., vol. 66, no. 5, Jan. 31, 1920, pp. 167-170. Résumé of practices of Southern Pacific Company in conducting its stores department affairs, particularly as related to shop requirements of mechanically equipped department.

Valve-Motion Work. Standard Motion Work Aids Valve Setter, J. McAllister. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 166-167, 3 figs. Method of handling motion work developed at West Albany shop, New York Central Railroad.

Welding Equipment. See ELECTRIC WELDING, Railway Shop Equipment.

RAILWAY SIGNALING

A. C. Motors for. A. C. Signal Mechanism, A. E. Tattersall. Ry. Engr., vol. 40, no. 479, Dec. 1919, pp. 266-269, 8 figs. Comparative study of commutator series motors and induction motors.

Automatic. Automatic Signaling on Melbourne Railways, F. M. Calcutt. Elec. Traction, vol. 16, no. 6, June 1920, pp. 398-402, 6 figs. Three-position automatic signals adopted by Australian electrified railways.

Automatic Train Control on the Cincinnati, Indianapolis & Western R. R. Ry. Rev., vol. 67, no. 14, Oct. 2, 1920, pp. 496-498, 4 figs. Electrically operated signal and stop system designed on closed circuit principle, so that opening of any closed circuit operates on side of safety.

Electric. Committee VIII—A. C. Automatic Block Signaling. Ry. Age (Daily Edition), vol. 68, no. 11b, Mar. 17, 1920, pp. 887-890. Specifications for resister to line and track circuits and for switchboard, recommended by committee of Am. Ry. Eng. Assn.

Electric Interlocking at Bellefontaine, Ohio, S. J. Dewey. Ry. Signal Engr., vol. 13, no. 3, Mar. 1920, pp. 110-114, 15 figs. Track layout showing location of switch, signal and derail functions.

Electric Signalling at Victoria Station. Elecn., vol. 84, no. 2185, April 2, 1920, pp. 371-373, 5 figs. Three-position system of South Eastern & Chatham Railway at station in London.

Report of Committee IV—D. C. Automatic Block Signaling. Ry. Age (Daily Edition), vol. 68, no. 11b, Mar. 17, 1920, pp. 877-879. Specification for d. c. motor-operated first range voltage high signal mechanism recommended by committee of Am. Ry. Eng. Assn.

See also Melbourne.

Electrically Lighted Signals. The Electric Lighting of Railroad Signals, L. C. Porter and F. S. Stallknecht. Illuminating Eng. Soc., Trans., vol. 15, no. 4, June 10, 1920, pp. 223-242, 24 figs. Advantages of electric lighting over oil lamps, factors to be considered in design of electric lamps, conversion of oil lamps into electric lamps.

Electropneumatic Plant. East Somerville Electro-Pneumatic Plant, Carl T. Smith. Ry. Signal Engr., vol. 13, no. 6, June 1920, pp. 239-242, 6 figs. It is related that Boston & Maine R. R. replaces mechanical with up-to-date power plant at important junction, increasing efficiency of operation. Description of installation, interlocking buildings, signal lighting, interlocking machine, terminal boards, and relay racks, illuminated track model, lever lights and relays, switch and signal indication circuits, and trunking and wire protection.

England. Three-Position Electrical Signalling. Ry. Engr., vol. 41, no. 481, Feb. 1920, pp. 65-68, 10 figs. Description of signaling installation at Victoria Station, Southeastern and Chatham Ry. Co., England.

Fog-Signaling. Fog-Signaling, L. Weissenbruch. Bul. Int. Ry. Assn., vol. 2, no. 4, Apr. 1920, pp. 173-203, 16 figs. Cab-signaling and automatic train stops on Belgian State Railways and elsewhere.

Induction Type. Light Signals to Supplant the Semaphore, A. H. Rudd. Ry. Signal Engr., vol. 13, no. 6, June 1920, pp. 234-237 and (discussion) pp. 237-238, 5 figs. Writer believes that automatic stop for the future will be of induction type, energy to be picked up from track by wireless or by some induction arrangement. Abstract of paper read before N. Y. Sectional Committee, Signal Division Am. R. R. Assn.

Interlocking. A Unique Crossing Gate Arrangement, Paul F. Bunker. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, p. 363, 1 fig. Apparatus and circuits for gate control from electro-pneumatic interlocking machine.

Electro-Mechanical Interlocking at Sunbury, Pa., John Moore. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 371-373, 3 figs. A. c. power is used for electric functions except signal control relays and locks on machines.

Report of Committee II—Mechanical Interlocking. Ry. Age (Daily Edition), Mar. 16, 1920, pp. 819-821. Specifications for mechanical interlocking machine and mechanical ma-

chine lever locking submitted to Signal Division, Eng. Section, Am. Railroad Assn.

See also Stevens Interlocking System.

Locating Signals. Locating Signals from Braking Distances, C. C. Thorn. Ry. Signal Engr., vol. 13, no. 1, Jan. 1920, pp. 7-10, 2 figs. Graphical chart for computing braking distances.

Melbourne. Signaling on Melbourne Electrified Railways, F. M. Calcutt. Ry. Signal Engr., vol. 13, no. 5, May 1920, pp. 184-198, 11 figs. Three-position automatic signaling is used. From Indus. Australian and Min. Standard.

Non-Automatic Blocks. Non-Automatic Blocks and Accident Records, W. P. Borland. Ry. Signal Engr., vol. 13, no. 8, Aug. 1920, pp. 306-309. Study of five-year record of collisions.

Radio Signaling. Augereau Wireless System of Railway Signaling (Le système Augereau pour la répétition des signaux sur les locomotives). Revue générale de l'Électricité, vol. 7, no. 15, Apr. 10, 1920, pp. 506-507, 3 figs. Apparatus for reproducing in locomotive cab by means of Hertzian waves signals usually indicated along track. This system has been tried successfully, it is said, by French State Railways.

Soda Cells. See BATTERIES, Soda Cells.

Spacing Trains Automatically. Automatic Signals for the Spacing of Trains, C. H. Tillett. Elec. News, vol. 29, no. 9, May 1, 1920, pp. 35-39, 9 figs. Notes on track circuit, signal indications, direct current signal control, neutral line control on double track signals, polarized relays, polarized line and track control, etc.

Stevens Interlocking System. Study of the Engagement Between the Working Blade and the Signal Lever in the Stevens Railway Interlocking System (Étude sur les enclenchements du système Stevens entre leviers d'aiguilles et de signaux), R. Desprets. Annales des Travaux publics de Belgique, vol. 20, no. 4, Oct. 1919, pp. 471-526, 46 figs. partly on supp. plate. System realizes engagement of blade and lever by control of bars having several slots, which are engaged or set free according to relative motion of slots with respect to system of blocks in track. Writer presents mathematical study of binary, ternary, etc., engaging combinations between two, three or four levers.

Systems. What Scheme of Signaling Is Most Desirable? Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 356-359, 3 figs. Comparative value of schemes. Abstracts of papers presented at meeting of St. Louis Sectional Committee of Am. Railroad Assn. Titles discussed were: Absolute Permissive Block Signaling, A. R. Fugina, Straight Automatic Blocking on the U. P. System, A. H. McKeen, and S. P. Single Track Signaling, E. E. Worthing.

Three-Position Signaling. Three-Position Signaling at Victoria—South Eastern & Chatham Railway. Ry. Gaz., vol. 32, no. 5, Jan. 30, 1920, pp. 152-155, 11 figs. Illustrated description is given of electrical three-position signaling designed and installed by British Power Ry. Signal Co. at London terminal.

Time vs. Space Intervals. The Use of Signals for Better Train Operation, Henry M. Sperry. Ry. Signal Engr., vol. 13, no. 7, July 1920, pp. 270-275, 5 figs. Comparison of time-interval and space interval methods leads to the conclusion that delays and hazards are reduced to the minimum by latter and that maximum track capacity is also possible under this method.

Track Circuits. A. C. Track-Circuiting Lay-Outs, A. E. Tattersall. Ry. Engr., vol. 40, no. 478, Nov. 1919, pp. 239-243, 20 figs. Siemens' system.

Study of Conditions Affecting Track Circuits, Fred W. Bender. Ry. Signal Engr., vol. 13, no. 2, Feb. 1920, pp. 68-78, 23 figs. Emphasizes importance of keeping rail and bonding resistance and voltage low to provide safety and increase efficiency.

Wireless Cab Signal. Operation of Augereau's Wireless Cab Signal. Ry. Signal Engr., vol. 13, no. 6, June 1920, pp. 247-248, 4 figs. Experiments with audible device controlled by Hertzian waves are said to have proved satisfactory in France and Government plans installation. Details and illustrations of Augereau's apparatus.

RAILWAY STATIONS

Lighting. See LIGHTING, Railway Stations.

Pavements for. See PAVEMENTS, CONCRETE, Railway-Station.

RAILWAY SWITCHES

Bridge Plant. A Special Circuit Saves Money, R. M. Phinney. Ry. Signal Engr., vol. 13, no. 2, Feb. 1920, pp. 53-54, 3 figs. Saving of $4300 per year is said to have been brought about as result of removing small interlocking plant at Boone bridge on Chicago & Northwestern and substitute of automatic features without eliminating any of safety factors or changing operating conditions.

Curved Crossings. Switches with Curved Crossings (Weichen mit gekrummten Herzstücken), H. Schwartz. Zentralblatt der Bauverwaltung, vol. 40, no. 19, Mar. 6, 1920, pp. 119-123, 19 figs. Describes new switches, some of advantages of which are said to be: With 190-m. radius switch, a 1:6 set of points can be obtained without changing the tongue arrangement and the 1:9 radius of switch; the 1:7 switch can be dispensed with; number of required switches and accessory parts is diminished, etc.

Interlocking. An Electric Interlocking Replaces a Pneumatic, B. A. Lundy. Ry. Signal Engr., vol. 12, no. 12, Dec. 1919, pp. 418-425, 13 figs. Direct-current installation permitting attendance of boiler by signalman without his having to pass through relay room or come in contact with any of switchboards or relays.

Lever-Throw. Using Lever-Throw Track Switches for Safety, Clifford A. Elliott. Elec. Ry. Jl., vol. 54, no. 21, Dec. 20, 1919, pp. 987-988, 3 figs. At locations where traffic conditions make it dangerous to use switch which must be held in position.

Low-Voltage Machines for. Low Voltage Machines for Switch Operation, J. E. Saunders. Ry. Signal Engr., vol. 13, no. 2, Feb. 1920, pp. 50-53, 3 figs. Advantages claimed for power operation of remotely located switches are increase in safety to traffic due to better control of train and switch movements and decrease in operating expense due to elimination of train stops at remotely located switches with resultant saving in fuel, wear and tear of brake and other equipment, and time of trainmen.

Snow Melters. Facilitating Switch Movements in Winter. Ry. Maintenance Engr., vol. 16, no. 5, May 1920, pp. 189-190, 3 figs. Also in Ry. Signal Engr., vol. 13, no. 6, June 1920, pp. 245-247, 4 figs. Electric snow melter made up of simple heat unit encased in water-proof cast-iron box measuring 15⅞ in. x 5 in. x 3¾ in.

See also RAILWAY SIGNALING, Interlocking.

RAILWAY TERMINALS

See TERMINALS, RAILWAY.

RAILWAY TIES

Cast-Iron. Experiments made to Determine the

Strength of Cast-Iron Bowl Sleepers, E. W. Stoney. Indian Eng., vol. 67, no. 6, Feb. 7, 1920, pp. 80-81, 13 figs. on two supp. plates. Weight of 479 lb. was allowed to fall from heights from 1 ft. 6 in. increasing by from 3 to 6 in. till failure took place. Results are shown in tabular statement and diagrams are included indicating particulars of ties tested and manner in which each failed.

Concrete. Concrete Track Ties and Electric Poles in China, Donald F. McLeod. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 554-555, 2 figs. Cost data.

Twenty Years of Reinforced-Concrete Railway Ties, Cyril H. Wakefield. Eng. News-Rec., vol. 84, no. 11, March 11, 1920, pp. 522-526, 12 figs. Review of experiments and experience in United States and foreign countries. It is said that results are largely inconclusive and unfavorable. Principal types that have been used are illustrated.

Durability of. Report of Committee III—On Ties. Bul. Am. Ry. Eng. Assn., vol. 21, no. 223, Jan. 1920, pp. 521-560, 11 figs. Account of experimental study undertaken to determine effect of design of tie plates and spikes on durability of cross-ties.

Mechanical Car Loading. Mechanical Tie Handling at Treating Plants. Ry. Rev., vol. 66, no. 8, Feb. 21, 1920, pp. 279-282, 14 figs. Methods of loading open-top cars. Report of committee to Am. Wood Preservers' Assn.

Metal vs. Wooden. The Relative Merits of Metal Versus Wooden Ties. Bul. Am. Ry. Eng. Assn., vol. 22, no. 227, July 1920, pp. 15-71, 18 figs. Report made by Committee on Ties to Am. Railroad Assn. It is said that no substitute tie has as yet been developed which can be recommended for general use on high speed insulated track. Development of substitute ties is recommended as means of conserving available timber supply. Statements made to urge introduction of substitute tie on claim that safe track cannot be maintained with wooden ties are said to be without foundation and contrary to facts.

Reinforced-Concrete. See Concrete.

Renewals. Influence of Treated Timber on Annual Cross Tie Requirements, Lowry Smith. Eng. & Contracting, vol. 53, no. 24, June 16, 1920, p. 688, 2 figs. Presents chart showing graphically the theoretical effect of use of treated cross-ties upon annual rate of renewal. From paper presented before Am. Wood Preservers' Assn.

Substitute Ties. No Immediate Necessity for Substitute Crossties. Ry. Age, vol. 69, no. 7, Aug. 13, 1920, pp. 275-277, 3 figs. Committee report to Am. Railroad Assn. It is stated that no substitute tie has as yet been invented which can be recommended for general use on high-speed insulated track, and it is emphasized that "any statements made to urge the introduction of a substitute tie on the claim that safe track cannot be maintained with wooden ties are without foundation and are contrary to facts."

Tampers, Electric. New Electric Tie Tamper. Elec. Traction, vol. 16, no. 3, Mar. 1920, pp. 175-177, 5 figs. Jackson electric tie tamper. Tamping bar exerts thrust in horizontal line forcing ballast underneath tie and also in backward direction compacting ballast near tie as additional support.

Tampers, Pneumatic. Pneumatic Tamping in Track Maintenance Work, J. Alex. Thorne. Ry. Gaz., vol. 33, no. 2, July 9, 1920, pp. 69-70. Data showing performance of tamper over long periods on important railway systems in the U. S. show a reduction in labor and saving in maintenance cost.

Some Notes on the Pneumatic Tie Tamper, W. H. Armstrong. Ry. Maintenance Engr., vol. 16, no. 3, Mar. 1920, pp. 115-116, 2 figs. Points out methods of operation that are found to secure best methods.

Tie-Plate Corrosion. Copper Reduces Corrosion in Tie Plates. Ry. Maintenance Engr., vol. 16, no. 7, July 1920, pp. 255-256, 2 figs. New York Central experiments showed that introduction of small percentage in steel made marked difference in corrosion of tie plates.

Tie Plates. Principles to Be Followed in Tie Plate Design, Howard H. George. Elec. Ry. Jl., vol. 56, no. 8, Aug. 21, 1920, pp. 359-361, 2 figs. Specifications for steel tie plates. Results of tests carried out by New York Central Railroad.

RAILWAY TRACK

Ashpits. Railway Ashpits of New Design. Eng. News-Rec., vol. 83 (no. 21, Dec. 11 and 18, 1919, pp. 1007-1008. Sides are vertical instead of sloping and ash-car track is on center line instead of being outside pit.

Ballast. A Scientific Study of Railway Track Under Load. Ry. Age, vol. 68, no. 11, Mar. 12, 1920, pp. 775-779. Results of field and laboratory tests are said to have indicated that presence of ballast above level of bottom of tie has little influence on quiescent load which will be carried before ballast will work out from under tie and allow it to settle, but that under repeated applications of load and particularly under jarring and vibratory loads ultimate carrying capacity of ballast is considerably increased by raising level of ballast surface to top of tie.

Report of Committee II—On Ballast. Bul. Am. Ry. Eng. Assn., vol. 21, no. 222, Dec. 1919, pp. 365-409, 15 figs. Standardization of ballast tools is suggested; specifications are recommended for storm ballast, and instructions are formulated to govern ballasting on operated line.

Concrete Roadbed. Concrete Roadbed for Track, Tunnels and Stations. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 826-828, 9 figs. Experience of various railways is quoted in securing increased stability and decreased maintenance by using concrete slab base under railway track. From report of Ballast Committee of Am. Ry. Eng. Assn.

Concrete Supports. Concrete Track Supports, A. C. Irwin. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 729-735, 10 figs. Details of concrete track construction on various roads in U. S. A.

Crossings. Concrete Slabs Under Railway Crossings. Ry. Maintenance Engr., vol. 16, no. 4, Apr. 1920, pp. 143-144, 6 figs. Slabs used by Chicago, Burlington & Quincy under crossing of two main line tracks. Outside dimensions were 10 ft. x 10 ft. with depth of 1 ft. 8 in.

Renewing Double-Slip Crossings as a Unit. Ry. Maintenance Engr., vol. 16, no. 4, Apr. 1920, pp. 141-142, 3 figs. Use of derricks in replacing six no. 10 P. S., 100-lb. double-slip crossings with 130-lb. material, doubled output of work per man per hour and reduced by 50 per cent number of days required for doing work.

Renewing Railway Crossings and Special Work, Clifford A. Elliott. Elec. Ry. Jl., vol. 55, no. 8, Feb. 21, 1920, pp. 370-372, 2 figs. Experience of Pacific Electric Ry., Los Angeles, Cal., in maintaining many railway crossings, crossovers and special work layouts on its lines.

Embankment Shrinkage. Experiments Give Data on Embankment Shrinkage. Ry. Age, vol. 68, no. 23, June 4, 1920, pp. 1573-1577, 5 figs.

Results obtained by Chicago, Burlington & Quincy R. R. are said to confirm prevailing theory that earth in embankments taken from the top four feet of excavation shrinks, and that from lower depths in excavation it swells.

Fills. Shrinkage and Swell of Materials in Railway Fills. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 418-419, 1 fig. Results covering many rock and earth materials obtained from actual measurement. Abstract of Subcommittee report, Presidents' Conference Committee, Federal Valuation of Railroads of U. S.

Frog Angles, Measuring of. Model Railway Matters. Model Engr. & Elecn., vol. 42, no. 983, Feb. 26, 1920, pp. 197-199, 4 figs. Details of curves, points and crossings. Method of measuring railway frog angles and of calculating length of crossovers.

Grade Crossings. See GRADE CROSSINGS.

Improvement. Improvements in Railway Track Construction (Neuerungen im Eisenbahnoberbau), Jos. Weig. Zentralblatt der Bauverwaltung, vol. 40, no. 27, Apr. 3, 1920, pp. 158-160, 6 figs. Describes new method of diminishing possibility of shifting of interior portions of the ballast through reinforcement with especially shaped reinforced concrete grids under both ties at a rail joint, thereby increasing the load capacity of ballast.

Maintenance. How to Maintain Track, R. H. Findley. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 762-764. Concerning selection of ties and uses of labor-saving track tools and of arc-welding in maintaining special work. Paper read before Iowa Electric Ry. Assn.

Labor Saving Devices in Maintenance of Way Work. Eng. & Contracting, vol. 53, no. 7, Feb. 18, 1920, pp. 174-175, 2 figs. Information on mechanical tie tampers, rail-handling and rail-laying machines, snow-melting devices, dump box for push cars, anti-rail creepers, ditching machines, dump cars, spreaders, etc., abstracted from committee report adopted at meeting of Roadmasters & Maintenance of Way Assn.

See also MAINTENANCE OF WAY.

Nut Lock. A New Nut Lock. Ry. Maintenance Engr., vol. 16, no. 1, Jan. 1920, p. 18, 2 figs. Nut is prevented from turning by washer which has two interior lugs that fit into grooves cut in opposite sides of bolt and extended from end of latter to some distance beyond end of threads.

Rail Creeping. The Cause and Prevention of Rail Creeping. Ry. Maintenance Engr., vol. 16, no. 2, Feb. 1920, pp. 55-57, 1 fig. Discussion of different factors producing longitudinal movements in railroad tracks. Reference is made to experiments in which two wheels of same dimensions, one 25 times as heavy as the other were used, care being taken to avoid possible movements of track by any influence besides that of rolling wheel. From papers presented before Inst. C. E.

Rails. See RAILS.

Scales. See SCALES, Truck.

Sidings. The Laying Out of Private Sidings (Richtlinien für Privatanschlussgleise), Friedrich Hasse. Fördertechnik u. Frachtverkehr, vol. 13, no. 4, Feb. 20, 1920, pp. 37-40, 18 figs. Examples of schemes designed and installed by author in his capacity of designing engineer of the Becker & Co. Railroad Construction, Ltd., Berlin.

Slip Roads, Shortening of. Devices for Shortening Slip Roads, A. Goupil. Bul. Int. Ry. Assn., vol. 1, no. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 245-249, 7 figs. By lengthening connecting curve of switch by eliminating continuation of nose of frog to mathematical intersection point. Translated from Génie Civil.

Snow Removal. See SNOW PLOWS.

Spikes. Laboratory Tests on Holding Power of Track Spikes. Ry. Age, vol. 67, no. 26, Dec. 26, 1919, pp. 1237-1239, 5 figs. Results of tests at Columbia Univ. on holding power of Sessler grip spike with that developed by ordinary cut spikes and screw spikes.

Purchasing Track Spikes Under Specifications, Howard H. George. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 147-149, 1 fig. Points out benefit derived from having reasonable specification on which to purchase spikes and observes that cost of inspection to insure proper compliance is small. Specifications of Am. Elec. Ry. Assn. for steel and iron track spikes are quoted.

Report of Committee on Track. Bul. Am. Ry. Eng. Assn., vol. 21, no. 221, Nov. 1919, pp. 147-171, 4 figs. Also in Ry. Age (Daily Edition), vol. 68, no. 11b, Mar. 17, 1920, pp. 849-856, 28 figs. Report recommends specifications for steel cut track spikes, steel tie plates, steel screw track spikes, wrought-iron tie plates and malleable-iron tie plates.

Spirals, Standard. Present Status of Standard Track Spirals. Elec. Ry. Jl., vol. 55, no. 7, Feb. 14, 1920, pp. 335-338, 3 figs. Report of sub-committee of Am. Elec. Ry. Eng. Assn. emphasizes value of standards and indicates that partial renewal with standards is feasible.

Stresses in. A Scientific Study of Railway Track Under Load. Ry. Age, vol. 68, no. 10, Mar. 5, 1920, pp. 670-673, 2 figs. Investigations of Special Joint Committee of Am. Soc. Civil Engrs. and Am. Ry. Eng. Assn.

Second Progress Report of the Special Committee to Report on Stresses in Railroad Track. Proc. Am. Soc. Civil Engrs., vol. 46, no. 2, Feb. 1920, pp. 133-304, 100 figs. Report of joint committee of Am. Soc. of Civil Engrs. with Am. Ry. Eng. Assn. Also in Bul. Am. Ry. Eng. Assn., vol. 21, no. 224, Feb. 1920, pp. 1-170, 100 figs. It is concluded from results obtained in numerous tests with different types of engines that action of driving-wheel counterbalance multiplies static load stresses in rail. In some cases excess stress chargeable to unbalance is much more than static rail stress. Nature of service given by tie is defined by measurements of tie bending and distribution of rail load to ballast.

Switches. See RAILWAY SWITCHES.

Tie Tampers. See RAILWAY TIES, Tampers.

Ties. See RAILWAY TIES.

Track Elevation. Elevation of C. B. & Q. Tracks at Aurora, Ill. Ry. Rev., vol. 66, no. 11, March 13, 1920, pp. 405-410, 13 figs. Details of improvement that eliminates many grade crossings throughout city.

Transition Curves. New Transition Curve Based upon the Lemniscate, J. E. Williams. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 406-407, 3 figs. Method of locating points of curve.

The True Transition Curve for Railway Problems, George Paaswell. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 407-409, 4 figs. Suggested simplification on mathematical work. Functions of true transition curve, with tables for supplying curve in practice.

Turntables. Turntable Reinforced by Trussing to Carry Heavy Engines. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, p. 1014, 2 figs. Reinforcement consisted in converting turntable into bottom chord of king-post truss.

War Construction, France. Some Engineering Work Done by the 277th Railway Com. (R. E.) in France and Belgium during the War, R. H. Cunningham. Soc. of Engrs. Jl. & Trans., vol. 11, no. 2, 1920, pp. 44-67 and (discussion) pp. 68-74, 17 figs., 6 on supp. plate. Discusses

gage on curves, Canadian type of permanent way, double-tracking, light railways, work done during 1918, reconstruction of line from River Lys to Lille, rail joints and anti-creep devices, etc.

[See also SNOW PLOWS.]

RAILWAY YARDS

Classification Yard. Michigan Central Builds Large Classification Yard. Ry. Age, vol. 68, no. 4, Jan. 23, 1920, pp. 287-291, 10 figs. Project involving change in divisional points and expenditure of over $4,000,000.

Freight Yard, Gravity. Gravity Freight Yard for Michigan Central Railroad. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 81-84, 5 figs. How design was influenced by special condition imposed by fact that Niles, where yard was built, is junction of two lines forming loop between Jackson and Niles.

Hump-Track Curves. See PIERS, Coal, Track Layout.

New Haven, N. H. New Haven Builds Freight Yards at Cedar Hill. Ry. Age, vol. 69, no. 5, July 30, 1920, pp. 179-183, 9 figs. Yard will be six miles long and one-half mile wide and will furnish standing capacity for 11,000 cars. Yard will receive trains from all lines converging at New Haven and will classify cars into trains for proper destinations.

RAILWAYS

Accidents. See ACCIDENTS, Grade Crossings.

Baghdad. The Baghdad Railway. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 174-175 and p. 184, 8 figs. Notes on construction and equipment.

Brakes. See BRAKES.

Car Lighting. See CAR LIGHTING.

China. The Chinese Government Railways, Frank Rhae. Railroad Herald, vol. 23, no. 12, Nov. 1919, pp. 17-24, 22 figs. Signalling, construction and maintenance methods. Trade Commissioner's Report to U. S. Dept. of Commerce.

Construction. See RAILWAY CONSTRUCTION.

Economic Needs of. See LOCOMOTIVES, Motive-Power Economics.

Electrical Specifications. Report of Committee on Electricity. Bul. Am. Ry. Eng. Assn., vol. 21, no. 221, Nov. 1919, pp. 173-255, 21 figs. Railroad specifications for electric light, power supply and trolley lines crossing stream and electric railways are recommended.

Electrification. See RAILWAY ELECTRIFICATION.

Elevated. See ELEVATED RAILWAYS.

Embankments. Embankment Filling Without Trestles. Ry. Rev., vol. 66, no. 26, June 26, 1920, pp. 1093-1096, 6 figs. Description of building up embankments from low level with spreader plows, on dumps of Hull-Rust Mine, Oliver Iron Mining Co., Hibbing, Minn.

France. The Railways of France, Charles Weiss. Cornell Civ. Engr., vol. 28, no. 4, Jan. 1920, pp. 179-185, 1 fig. Account of war and peacetime operation, station and other facilities, rolling equipment, track, signals, etc.

Franchises, Service-at-Cost. Service-at-Cost Bibliography, Mary P. Billingsley. Aera, vol. 8, no. 4, Nov. 1919, pp. 494-501. Including chronological list of service-at-cost franchises.

Freight Terminals. See TERMINALS, FREIGHT.

Fuel Stations. Fuel Stations. Ry. Age, vol. 68, no. 26, June 25, 1920, pp. 1984-1986, 4 figs. Developments in design. Report presented at convention of Int. Ry. Fuel Assn.

Government Ownership. Canada's Extension of Railway Nationalization. Ry. Age, vol. 67, no. 19 and 20, Nov. 7 and 14, 1919, pp. 906-910 and 972-973. Transportation situation as developed by government ownership. Events and policies which have tended to create Dominion-owned transcontinental line.

Industrial. Continuity of Operation Essential to Success in the Use of Industrial Railway, H. Eltinge Reed. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 273-276, 5 figs. Factors quoted as making for success are ample provision for materials delivery, correct routing, uninterrupted transit, coördination of plant units, and upkeep of machinery.

Maintenance. See RAILWAY MAINTENANCE.

Marine Terminal. The Marine Terminal Railway, H. M. L. Harding. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 741-742. General principles governing location and arrangement of tracks and movement of freight.

Merger, Plan for. The Plan for Merging the Railroads. Ry. Rev., vol. 66, no. 6, Feb. 7, 1920, pp. 209-211. Fourteen competing systems proposed to include 160 Class I lines.

Military. See RAILWAYS, MILITARY.

Motor-Truck Competition. See MOTOR TRUCKS, Competition with Railways.

Narrow-Gage. Sixty-Centimetre Railways on the Western Front, A. L. Stead. Tramway and Ry. World, vol. 48, no. 14, Sept. 16, 1920, pp. 136-139, 2 figs. Types of steam and gasoline locomotives used.

Solving the Short-Haul Problem, Charles F. Lang. Sci. Am., vol. 122, no. 22, May 29, 1920, p. 600 and p. 610. Rôle of light narrow-gage railway in local transportation of the future.

Operation. See RAILWAY OPERATION.

Projected, France. From Europe to Africa and America Through Spain (De l'Europe à l'Afrique et à l'Amérique par l'Espagne), M. N. Suss. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs Civils de France, vol. 72, nos. 7, 8 and 9, July-Sept. 1919, pp. 387-428, 6 figs. Concerning railway routes projected by French Government.

Rails. See RAILS.

Repair Shops. See RAILWAY REPAIR SHOPS.

Rolling Stock. See CARS; LOCOMOTIVES.

Safety Work. The Economic Value of Railway Safety Work, Samuel O. Dunn. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 605-607. Survey of improvements in railway accident record within last decade. Paper read before Nat. Safety Council.

Shops. See RAILWAY SHOPS.

Signaling. See RAILWAY SIGNALING.

Snow Removal. See SNOW PLOWS.

Spain. The Three Principal Aspects of Railroads (Los tres principales aspectos que presentan los ferrocarriles), Francisco Cambo. Revista de Obras Publicas, vol. 67, no. 2301, Oct. 30, 1919, pp. 534-539. Technical, economical and financial. Article discusses question of extending and improving railway service in Spain.

Street. See STREET RAILWAYS.

Terminals. See TERMINALS, RAILWAY.

Testing Cars. Railway Testing Cars. Ry. Engr., vol. 41, no. 484, May 1920, pp. 209-213, 6 figs. Description of modern equipment of a testing car built to determine train speed, draw-bar pull, brake performance, etc.

Track. See RAILWAY TRACK.

Traction on Heavy Gradients. Traction on Heavy Gradients by Means of Auxiliary Adhesion, Ch. Dantin. Bul. Int. Ry. Assn., vol. 2, no. 5, May 1920, pp. 272-284, 11 figs. Use of Hanscotte

system for haulage of artillery trains. Translated from Genie Civil.

Train Heating. See TRAIN HEATING.

Train Lighting. See TRAIN LIGHTING.

Underground. See SUBWAYS.

Valuation. The Prospective Competitor Method of Valuation of Property, M. L. Byers. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 4, April 1920, pp. 571-617. Method is based on determination of (1) earning power of which competitor is assured to have at commencement of normal operation, second year of operation in case of railroad, and (2) rate of increase of earning power. Method as exemplified by application to valuation of Virginian Railway.

See also VALUATION, Theory of.

Value for Rate Making. What is Value for Rate Making Purposes, Wm. G. Raymond. Ry. Age, vol. 69, no. 9, Aug. 27, 1920, pp. 353-357. It is suggested to determine interest on investment and profit to be earned and that sum of these two divided by fair rate of return should give value of property.

Water Tanks. See WATER TANKS.

RAILWAYS, MILITARY

Light Railways, French Battle Front. The "Light Railways" of the Battle Front in France, Frank G. Jonah. Proc. Am. Soc. Civil Engrs., vol. 46, no. 1, Jan. 1920, pp. 81-98, 20 figs. partly on 4 supp. plates. Types of "light railways" built at the front by American, French, English and German troops.

The English Field Railways in France (Die Feldbahnen der Engländer an der Westfront), H. Blum. Zeitschrift für Kleinbahnen, vol. 27, no. 5, May 1920, pp. 157-162, 1 fig. Outlines main features of the English railway system and points out differences between German and English systems.

Narrow-Gage. Notes on Army's Light-Railway Practice in France, Paul McGeehan. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 653-655, 1 fig. Experience is outlined as presenting field for improvement in certain details of construction and equipment of narrow-gage lines.

Operation. Field Railway Operation (Das Feldeisenbahnwesen), H. Bode. Annalen für Gewerbe u. Bauwesen, vol. 86, no. 11, June 1, 1920, pp. 88-94. Account of organization of the field railway in its development during the war, in connection with which certain special problems are discussed, such as schedule planning, speeds, repair of parts, and the procuring of construction material. Address read before Assn. German Machine Engrs.

[See also RAILWAYS, Narrow-Gage.]

RAINFALL

Boston, Mass. Maximum Rates of Precipitation at Boston for Various Frequencies of Occurrence, Harrison P. Eddy. Jl. Boston Soc. C. E., vol. 7, no. 2, Feb. 1920, pp. 47-79, 6 figs. Data relative to occurrence of excessive storms, giving rates which have prevailed for various durations and frequency at which such storms have recurred. From record of Chestnut Hill Reservoir covering 38 years, and Weather Bureau station covering 26 years.

Run-off. See STORM WATER.

RAIN GUARDS

Centrifugal. Centrifugal Rain and Spray Guard. Eng., vol. 128, no. 3326, Sept. 26, 1919, pp. 319, 3 figs. Device for keeping window or screen free from water, rain or snow.

RANGE FINDERS

Barr & Stroud. The Works and Products of Messrs. Barr and Stroud, Limited. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 536-540, 29 figs., partly on two supp. plates. Range finders and fire-control gear.

Naval, Accuracy of. Range Finders and Range Finding, F. J. Cleary. Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 1-37, 25 figs. Notes on accuracy of range finders employed in naval service and suggestions in regard to care that must be exercised in handling them.

[See also ARTILLERY, Range Finders.]

RANGES

Electric vs. Gas. See ELECTRIC RANGES.

RAPID TRANSIT

American Cities. Functions of Rapid Transit Lines in Cities, Henry M. Brinckerhoff. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 631-636, 4 figs. Capabilities of each transportation agency are outlined, effect of geographical distribution on transportation conditions is studied, and trend in rapid transit development in cities surveyed.

Berlin. Rapid Transit Development at Berlin, E. C. Zehme. Elec. Ry. Jl., vol. 56, no. 1, July 3, 1920, pp. 17-20, 4 figs. Project involving electrification of city and suburban lines. It is contemplated to use 15,000-volt, single-phase system, with cableless locomotives and power generated from gasified fuel.

REACTORS

Voltage Stresses. Voltage Stresses in Reactors in Service, F. H. Kierstead and Royal Meeker. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 552-554, 3 figs. Experimental data are presented together with physical explanation of phenomena revealed. It was found, in part, that steep waves may be produced by sudden drop in voltage caused by short-circuit and that resistance shunting of an inductance reduces voltage stresses caused by steep waves.

REAMERS

Wear of. Disposition of Limits in Relation to Reamer Wear, Francis W. Shaw. Machy. (Lond.), vol. 15, no. 378, Dec. 25, 1919, pp. 385-386, 3 figs. Illustrates unilateral and bilateral systems of determining tolerances.

RECLAMATION

Mississippi Valley. Reclamation by Drainage of Land in the Mississippi Valley, Edmund T. Perkins. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 215-217, 4 figs. Possibilities of developing natural resources of region.

Possibilities in U. S. Report on Development of Unused Lands. Eng. News-Rec., vol. 84, no. 8, Feb. 19, 1920, pp. 375-377. Study of possibilities of reclaiming arid, wet and cut-over timber lands, made by U. S. Reclamation Service in latter part of 1919.

[See also IRRIGATION, Concrete-Lined Canals.]

RECONSTRUCTION, POST-WAR

Engineer's Part in. The Human Element in Engineering, J. Hamilton Gibson. Engineering, vol. 108, no. 2811, Nov. 14, 1919, p. 667. Important part the engineer must play in reconstruction work. Presidential address read before Liverpool Eng. Soc.

RECORDS

Filing and Indexing. Office Records—Their Filing and Indexing, Irene Warren. Jl. Electricity, vol. 44, nos. 1 and 11, Jan. 1 and June 1,

1920, pp. 22-23 and 563-564, 3 figs. Advantages of central filing system. Suggestions in regard to handling back files and follow-up systems for incoming and outgoing mail.

RECOVERANCE

See MATERIALS, Testing; MEASURING MACHINES, Modulimeter; STRESSES, Recoverance.

RECTIFIERS

Aluminum. Wave Form Obtained from the Aluminum Rectifier, N. H. Williams and J. M. Cork. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 937-938, 6 figs. Pulsating current and voltage from aluminum rectifiers smoothed out by inductance in series and condensers across load.

Kenotron. Thermoelectric Emission and Its Applications: The Kenotron (L'émission thermoélectrique et ses applications: le kénotron), G. Johannes. Revue générale de l'Électricité, vol. 7, no. 22, May 29, 1920, pp. 733-746, 19 figs. Construction and operation of kenotron.

Large-Capacity. Mercury Arc Rectifiers for Large Outputs. Electrician, vol. 84, no. 2172, Jan. 2, 1920, pp. 10-13, 8 figs. Diagrammatic representation of types built by Brown, Boveri & Co., Switzerland, for outputs of 150-kw. and 500-kw.

Mechanical. Mechanical Alternating-Current Rectifiers (Le redressement des courants alternatifs par des appareils mécaniques), Alfred Soulier. Revue générale de l'Électricité, vol. 7, no. 19, May 8, 1920, pp. 619-625, 10 figs. Apparatus designed by writer.

Mercury-Vapor. Large Rectifiers (Grossgleichrichter), M. Clarnfeld. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 21-22, May 29, 1920, pp. 403-406, 9 figs. Discussion of basic principles and construction of large mercury-vapor rectifiers with reference to their advantages and especially their very high efficiency.

The Glass Type of Mercury Vapor-Arc Rectifier, Its Theory and Practical Operation (Der Quecksilberdampf-Gleichrichter der Glastype, seine Theorie und Praktische Ausführung), Fritz Kleeberg. Elektrotechnische Zeitschrift, vol. 41, nos. 9 and 10, Feb. 26 and Mar. 4, 1920, pp. 171-173 and 193-197, 17 figs. Results of experiments for cooling glass structures in an artificial air current are said to show a 200 per cent improvement in load capacity. It is demonstrated that, with aid of proper connection of choking coils, the rectifier can be adapted to any desired conditions. Address before Electrotechnical Assn., Berlin.

New Type. A New Rectifier of Alternating Current for Charging Storage Batteries (Un nouveau redresseur de courant alternatif pour charge d'accumulateurs), J. Quinet. Electricien, vol. 35, no. 1254, June 15, 1920, pp. 250-252, 4 figs. Mechanical apparatus operating on principle of Soulier type, but utilizing both alterations of current instead of only one. Soulier's rectifier is of mechanical type and rectification is effected by oscillations of metallic plate which by contact allows passage of current in only one direction.

Voltage Multiplication. Establishment of a Continuous-Current Voltage which is a Multiple of the Alternating Voltage Employed without Using a Transformer (Erzeugung einer Gleichspannung vom vielfachen Betrage einer Wechselspannung ohne Transformator), H. Greinacher. Schweiz. Elektrotechnischer Verein, Bul., vol. 11, no. 3, Mar. 1920, pp. 59-66, 6 figs. Reference is made to system for transforming alternating current into constant continuous current previously described by which continuous-current voltage is delivered of double the value of the alternating-current voltage. Writer claims he has now succeeded in tripling the voltage by the use of condensers and valve cells, and theoretically, at least, established possibility of multiplying voltage to any desired extent.

[See also ELECTRIC CURRENTS, ALTERNATING, Rectification; THERMIONIC VALVES.]

REDUCTION GEARS

Alignment Meter. Alignment Meter for Turbine Gearing. Engr., vol. 129, no. 3361, May 28, 1920, p. 559, 4 figs. Details and diagram of simple device whereby lack of parallelism of two or more shafts can be measured and registered.

Design. High-Speed Gearing. Times Eng. Supp., no. 542, Dec. 1919, p. 364. Design and construction of high-speed turbine gears. Paper read before Manchester Assn. of Engrs.

Pinions and Shafts for Double Helical Gears, William J. Kearton. Engr., vol. 129, no. 3347, Feb. 20, 1920, pp. 186-188, 5 figs. Points out that in turbine reducing gears in which pinion shaft is supported in three bearings, the ideal design would be that in which an equal intensity of pressure on all bearings could be assured; problem of determining the bearing loads in such a gear is statically indeterminate. Includes diagrams showing calculated curves of bending moments, etc.

High-Speed. High-Speed Turbine Gears, Gerald Stoney. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 729-734, 15 figs.; also Machy. (Lond.), vol. 15, no. 375, Dec. 4, 1919, pp. 304-306, 5 figs. Types of gearing suitable for use with steam turbines. Notes on design of helical gears. Paper read before Manchester Assn. of Engrs.

Types. Reduction Gears for Marine Turbines (Réducteurs de vitesse à engrenages pour turbines marines), M. Vasset. Bulletin technique du Bureau Veritas, vol. 2, no. 6, June 1920, pp. 107-111, 11 figs. Classification and description of the types built in France, England and United States.

Warships. Experience and Practice in Mechanical Reduction Gears in Warships, H. B. Tostevin. Eng., vol. 109, no. 2832, April 9, 1920, pp. 474-480 and p. 482, 16 figs. Also in Shipbuilding & Shipping Rec., vol. 15, no. 14, Apr. 1, 1920, pp. 442-445, 3 figs.; and Engr., vol. 129, no. 3355, Apr. 16, 1920, pp. 405-407, 6 figs. Changes introduced since 1910 in type then first adopted by British Admiralty. Attention is particularly directed to sprayer used for lubricating reduction gears of British torpedo-boat destroyers. Paper read before Instn. Naval Architects.

See also MARINE STEAM TURBINES, Geared.

RE-EDUCATION

See CRIPPLED SOLDIERS, Reëducation.

REFLECTIVITY

Stellite and Silver. Reflecting Power of Stellite and Lacquered Silver, W. W. Coblentz and H. Kabler. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 342, Sept. 11, 1919, pp. 215-217. Data presented show that reflectivity of stellite varies somewhat in visible spectrum, depending upon homogeneity and upon exact composition of alloy. Data on reflecting power of lacquered silver mirrors show that owing to photochemical action in lacquer, silver is turned brown in color, thus reducing its reflecting power.

REFLECTORS

Luminous Intensity. Calculating the Luminous Intensity of a Diffusing Reflector from Uneven Intrinsic Brilliancy (Berechnung des Lichtstärke des diffusen Reflektors von ungleichmässiger Flächenhelle), R. Böker. Elektrotechnik und Maschinenbau, vol. 37, no. 33, Aug. 17, 1919, pp. 365-366, 1 fig. Reference is made to article by Halbertsma in a previous issue of same journal (no. 19, 1919, p. 197) giving a calculation of light distribution of a diffusing reflector which, although it deviates from Lambert's law, does not compute this deviation in the different angle. Writer presents as a supplement to above-mentioned work, a computation employed by him for some time according to a method of equivalent luminous surface.

Parabolic. The Electrolytic Manufacture of Parabolic Reflectors, Samuel Wein. Brass World, vol. 16, no. 8, Aug. 1920, pp. 218-220. Summary of patents and recent improvements in manufacturing process.

REFRACTION

Index of, Measurement. Immersion Method for Measuring Indices of Refraction of Solid Bodies (Méthode par immersion pour la mesure des indices de réfraction des corps solides), Ch. Fabry. Jl. de Physique Théorique et Appliquée, vol. 8, Jan. 1919, pp. 11-25. Principle of method consists in immersing solid in liquid the composition of which is varied until its index of refraction for a certain radiation is the same as that of solid, equality of indices being determined by fact that passage of radiation through solid is accomplished without any deviation taking place.

REFRACTORIES

Alumina. Refractory Properties of Alumina Products (Propriétés refractaires des produits alumineux), H. Le Chatelier and B. Bogitch. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 11, Sept. 15, 1919, pp. 495-499, 1 fig. Comparison of experimental results obtained with bauxite brick, cornidite and products having carborundum base.

Classification. Refractories in Heat Treating Furnaces, John A. King. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 44-48. Classification of different types of refractory materials.

Coke-Oven. See COKE OVENS, Refractories for.

Firebrick. See FIREBRICK.

Furnace Linings. Refractories in Heat-Treating Furnaces, John A. King. Proc. Steel Treating Research Soc., vol. 2, no. 8, 1919, pp. 16-19 and 32. Deals with linings and factors which determine life of linings, and gives general outline of kinds of refractories and various tests applied to them.

Glass-Furnace. The Preservation of Glass Furnace Refractories by Water-Cooling, E. B. Christmas. Jl. Soc. Glass Technology, vol. 4, no. 13, May 1920, pp. 128-138, 6 figs. Advantages of coolers are explained and their operation and installation described.

Magnesite. Magnesite Refractories, J. Spotts McDowell and Raymond M. Howe. Jl. Am. Ceramic Soc., vol. 3, no. 3, March 1920, pp. 185-246, 5 figs. Survey of development of magnesia refractories in steel making, with notes on crude magnesite and the manufacture of magnesite bricks, as well as enumeration of properties of caustic, dead-burned and fused magnesia. Photomicrographs of magnesia brick are included, and also biography of magnesite and magnesite brick.

Properties at High Temperatures. The Measurement of Physical Properties at High Temperatures, A. George Tarrant. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 83-94 and (discussion) pp. 94-97, 10 figs. Account of experiments undertaken before war with view to obtaining some accurate knowledge of physical properties of refractory materials that might be of use in the commercial design of high-temperature apparatus.

Research. Extend Facilities for Refractories Testing. Brick & Clay Rec., vol. 56, no. 12, June 1, 1920, pp. 1100-1101. It is announced that facilities of fellowship endowed by Refractories Manufacturers' Assn. at Mellon Inst. of Indus. Research of University of Pittsburgh are now open to individual firms and corporations not manufacturers of refractories, according to resolution adopted on April 20 by Assn.

Report of Refractory Materials Research Committee. Gas Jl., vol. 150, no. 2978, June 8, 1920, pp. 576-583, 2 figs. Committee report of Instn. of Gas Engrs. Experiments are described which were performed to ascertain conditions required for successful casting of refractory ware containing high percentage of grog. Comparative tests were also reported of machine-made and hand-made silica bricks. Measured specific heats of various refractory materials at high temperatures are included.

Reversible Expansion of. The Reversible Expansion of Refractory Materials, H. J. Hodsman and J. W. Cobb. Gas Jl., vol. 151, no. 2985, July 28, 1920, pp. 184-187, 6 figs. Results of experimental research. States that calcined alumina, magnesia brick, carborundum, calcined kaolin and hard calcined ball-clay expand regularly up to 1000 per cent. Most refractories expand roughly ½ per cent up to 100 deg., but magnesia brick more than twice this amount. Paper read before Soc. of Glass Technology.

Silica Brick. See SILICA BRICK.

Sillimanite. The Commercial Synthesis of Sillimanite, Andrew Malinovszky. Chem. & Metallurgical Eng., vol. 22, no. 18, May 5, 1920, pp. 851-853, 3 figs. Cupola process for fusing alumina and silica to form sillimanite crystals. Reactions consist of forming carbides under reducing, and combusting them under oxidizing conditions.

Specific Heats. Specific Heat and Heat Conductivity of Refractories (Ueber spezifische Wärme und Wärmeleitfahgkeit feuerfester Erzeugnisse). Spechsaal, vol. 52, no. 51, Dec. 18, 1920, pp. 499-501, 2 figs. Gives review of results of three different investigations. Results of experiments are said to show that specific heats of firebricks of different composition show only slight variation.

The Specific Heats of Refractory Materials at High Temperatures, L. Bradshaw and W. Emery. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 22-24, Coking Section, 2 figs. Measurements of specific heats of silica, fireclay and zirconia.

Zirconia-Silica. An Approximate Determination of the Melting-Point Diagram of the System Zirconia-Silica, Edward W. Washburn and Earl E. Libman. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 634-640, 2 figs. It was determined in tests that for use as refractory up to about 2550 deg. cent. presence of silica as "impurity" in zirconia is not detrimental since fluxing action can be eliminated by adding enough more silica to bring total content up to 33 per cent. It is believed that refractories of considerable strength may be manufactured from powdered zircon bonded with small quantity of mixture of zirconium hydroxide and precipitated silica in molecular proportions and fired in electric furnace.

Zirkite. Resistance of Zirkite to Slag Corrosion. Iron & Coal Trades Rev., vol. 101, no. 2740, Sept. 3, 1920, p. 291. Experiments showed

that Zirkite is affected by fluorides or fluorine vapors.

[See also FIRECLAYS; SILICABRICK.]

REFRIGERATING MACHINES

Ammonia. Experiments with a Large Ammonia Refrigerating Machine (Versuche an einer grossen Ammoniak-Kältemaschine), Martin Krause. Zeitschrift für die gesamte Kälte-Industrie, vol. 27, nos. 3 and 4, Mar. and Apr. 1920, pp. 27-31 and 35-38, 2 figs. Mar.: Results of experiments carried out on a machine in a meat refrigerating plant designed to operate with brine temperatures of -20 to -22 deg. cent. Apr.: Results of various experiments are given in tabular form.

Household, Testing. Testing of Household Refrigerating Machines, Henry L. Lincoln. Am. Soc. Refrigerating Engrs., vol. 6, no. 2, Sept. 1919, pp. 91-102, 3 figs. Opinion is advanced that positive and accurate calibration of electrical instruments makes electrical balance most suitable means of determining refrigerating capacity of small machine.

REFRIGERATING PLANTS

Ammonia-Compression Plant. Two Indirect Methods of Finding the Weight of Ammonia in Circulation in Compression Refrigeration, J. W. Gavett, Jr. Power, vol. 51, no. 26, June 29, 1920, pp. 1042-1045, 6 figs. Non-mechanical methods of computing weight of ammonia by means of pressure-volume charts and temperature-entropy charts of ammonia cycle.

Ammonia Leaks. Testing for Ammonia Leaks in Refrigerating Plants, B. E. Hill. Power, vol. 51, no. 24, June 15, 1920, pp. 955-956. Directions for testing for ammonia leaks with phenolphthalein and sulphur sticks.

Edgewood Arsenal. Refrigerating Equipment for Edgewood Arsenal, J. O. Schultz. A. S. R. E. Jl., vol. 6, no. 1, July 1919, pp. 46-49. Plant was designed to be of daily capacity for filling nine thousand 4.7-in. shells and 21,000 75-mm. shells. Total cooling consists of 630,000 pounds of steel and 89,000 pounds of gas.

Flooded System of Ammonia Evaporation. The Flooded System for Evaporation Coils, G. H. Crawford. Power, vol. 52, no. 2, July 13, 1920, pp. 44-45, 3 figs. Features of different systems in common use in United States.

Flooded-Type Brine Cooler. Handling the Flooded-Type Brine Cooler, B. E. Hill. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 464-465. System of calcium brine coolers with pumps in basement or cellar floor and makeup brine tank on seventh floor is illustrated.

Ford Motor Co. Ford Uses Large Refrigeration Plant in Making Automobiles, Eric H. Peterson. Power, vol. 51, no. 10, Mar. 9, 1920, pp. 366-370, 10 figs. Describes four-unit motor-driven compression plant of 1000 tons refrigerating capacity used to cool quenching oil and drinking water; long sections of atmospheric condensers used for ammonia and stands of similar design, with principle of action reversed, cool the oil, although portion of oil is precooled by double-pipe water coolers.

Largest in World. The World's Largest Freezer. Power Plant Eng., vol. 24, no. 11, June 1, 1920, pp. 549-554, 11 figs. New Armour & Co. plant with 750-ton refrigerating capacity and storage space for 42,000,000 lb. of meat.

Quincy Market Co., Boston. See T-Wharf.

Three-Unit. Power and Refrigeration for Model Ice Cream and Dairy Plant. Power, vol. 51, no. 19, May 11, 1920, pp. 752-757, 9 figs. Modern 450-ton three-unit refrigerating plant using high-speed two-cylinder ammonia compressors, cross-connected so that either cylinder may be used on high or low-temperature service. Power and lighting are supplied by a 450-kw. electric generating condensing plant, the cooling water being conserved by large cooling tower on roof of building.

Troubles. Trouble-Hunting in Refrigerating Plants, J. C. Moran. Power, vol. 52, nos. 3 and 5, July 20 and Aug. 3, 1920, pp. 87-89, 2 figs., and 168-170, 2 figs. July 20: One installation of two 100-ton single-acting twin-cylinder machines, two double-pipe condensers, and direct-expansion coils was giving one-half of normal capacity only. How plant was brought back to normal production without introducing new machinery is related. Aug. 3: How a faulty gate valve in brine-circulating system caused freeze-up of nearly the entire system.

T-Wharf, Boston. The T-Wharf Plant, Quincy Market Cold Storage and Warehouse Co., Boston, Charles H. Bromley. Power, vol. 50, no. 18, Oct. 28-Nov. 4, 1919, pp. 638-644, 9 figs. Station is of 500 tons rated capacity, in one compound, high-speed, feather-valve ammonia compressor driven by 600-hp. synchronous motor.

Union Stock Yards, Chicago. Large Freezer Plant at Union Stock Yards, Chicago. Ice and Refrigeration, vol. 59, no. 2, Aug. 1920, pp. 37-40, 5 figs. Ten-story building erected at cost of about $2,000,000 with capacity for freezing approximately 50,000,000 lb. of meat and meat products.

[See also ICE PLANTS.]

REFRIGERATION

Brines, Properties of. Physical Properties of Brines, E. F. Mueller. A. S. R. E. Jl., vol. 6, no. 1, July 1919, pp. 25-31 and (discussion) pp. 31-33. Table is included giving heat content in B.t.u. per pound (mass) of calcium chloride brines of several specific gravities.

Ethyl Chloride. Ethyl Chloride Refrigeration, Albert Henning. Cold Storage, vol. 23, no. 262, Jan. 15, 1920, pp. 7-8. Table giving thermal properties of ethyl chloride.

Research. Education and Research in the Refrigerating Industry, J. Wemyss Anderson. Proc. Cold Storage & Ice Assn., vol. 14, 1917, pp. 5-15 and (discussion), pp. 16-30. Suggests that Cold Storage & Ice Assn. petition Government to subsidize Association Internationale du Froid, foster research and approve formation of Schools of Refrigeration.

Research in Refrigeration, J. Alfred Ewing. Cold Storage & Ice Assn. Proc., vol. 15, 1918-1919, pp. 109-118 and (discussion) pp. 119-124. Outline of work to be undertaken by Engineering Committee of Food Investigation Board.

[See also COLD STORAGE.]

REFRIGERATOR CARS

See CARS, REFRIGERATOR.

REFUSE DISPOSAL

New Orleans. Refuse Disposal, Thomas L. Willes. Proc. Louisiana Eng. Soc., vol. 5, no. 4, Aug. 1919, pp. 253-268 and (discussion) pp. 268-273. Tests conducted for period of one year to determine character and amount of waste in City of New Orleans are said to have shown that this refuse contained enough grease and other valuable materials to insure profitable operation of reduction and utilization plant.

Toronto Incinerator. New Toronto Incinerator, E. A. James. Can. Engr., vol. 38, no. 5, Jan. 29, 1920, pp. 175-176, 3 figs. Functions at rated capacity of 12 tons per 24 hours.

[See also STREET CLEANING.]

REGENERATIVE BRAKING

See RAILWAY ELECTRIFICATION, Regenerative Braking.

RELATIVITY

Einstein's Theory. A Determination of the Deflection of Light by the Sun's Gravitational Field, from Observations made at the Total Eclipse of May 29, 1919, by Sir F. W. Dyson, Prof. A. S. Eddington, and Mr. C. Davidson. Phil. Trans. Roy. Soc. of London, Series A, vol. 220, no. 9, pp. 291-333, 3 figs., 1 on supp. plate. Describes expeditions to Sobral and Principe. Results leave little doubt that a deflection of light takes place in neighborhood of sun and is of the amount demanded by Einstein's generalized theory of relativity, as attributable to the sun's gravitational field.

The Einstein Theory of Relativity and the Basic Principles of Mechanics (Die Relativitätstheorie von Einstein und die Grundlagen der Mechanik), B. Rülf. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 31 and 32, July 31 and Aug. 7, 1920, pp. 593-598 and 623-625, 7 figs. Notes on relativity principle of classic mechanics; proofs of the state of rest of ether; the Michelson test; the Lorentz theory of shortening of space; derivation of the Lorentz transformation; constancy of the expansion of light in all moving systems; the Einstein formula for speeds; discussion of the Lorentz equations; relativity of time; Minkowski's four-dimensional space-time continuum; the "sixth" sense; relativity of mass and energy and transformation of both in one another. The classic-mechanical interpretation of the accelerated and revolving movement; Einstein's equivalence principle; uniformity of heavy and inert mass; the revolving movement as relative movement; the new line element; Einstein's gravitation theory, etc.

Michelson's Experiment. Michelson's Experiment and Its Interpretation (L'esperienza di Michelson e la sua interpretazione). Il Nuovo Cimento, vol. 18, no. 6, Sept. 1919, pp. 91-106, 3 figs. In the light of modern theory of relativity.

Quaternions and Theory of. Applications of Quaternions to the Theory of Relativity, H. T. Flint. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 232, April 1920, pp. 439-449, 2 figs. Method is suggested for expressing theory of relativity completely by means of quaternionic operators.

Theory of. Geometric Interpretation of Universal Time in the Theory of Restricted Relativity (Interpretation géométrique du temps universel dans la théorie de la relativité restreinte), Charles Willigens. Archives des Sciences physiques et naturelles, vol. 2, July-Aug. 1920, pp. 289-300, 4 figs. Interpretation of time as introduced by Ed. Guillaume in the theory of restricted relativity. (See Archives des Sciences physiques et naturelles, 1918, p. 281, and 1920, p. 125.)

Points of Difference Between the Relativity Theories of Mewes, 1892-1893, and Lorentz, 1895 (Unterschiede zwischen der Relativitätstheorie von Mewes, 1892-1893, and Lorentz, 1895), Rudolf Mewes. Zeitschrift für Sauerstoff- und Stickstoff-Industrie, vol. 11, nos. 17-18 and 19-20, Sept. and Oct. 1919, pp. 70 and 75-77. Main difference is said to be that Mewes treats of rotary movement of ether particles or bodies around their axis together with their relative movement with or around one another; whereas Lorentz excludes the rotary movement altogether, and confines investigations to relative movement with and around one another—which, the writer claims, is the salient defect in the Lorentz theory as well as in investigations of A. Einstein (1905) and H. Minkowski (1907) which are based on this theory.

Some Functional Equations in the Theory of Relativity, Arthur C. Lunn. Bul. Am. Math. Soc., vol. 26, no. 1, Oct. 1919, pp. 26-34. Attempt to transcribe more completely by means of functional equations and their solutions without appeal to differentiation of relations connecting space-time coördinates in two systems of reference, which Einstein obtains in transcribing process of light signal.

See also Einstein's Theory.

[See also GRAVITATION, Relativity Theory.]

RELAYS

Overload. Induction-Type Overload Relays—Their Operation and Application, Victor H. Todd. Power, vol. 50, no. 16, Nov. 22, 1919, pp. 583-585, 13 figs. Discusses construction and operation of overload relay, in which movement similar to watt-hour meter is used to obtain protective device of high accuracy.

Overload Relays—Principles of Operation, Victor H. Todd. Power, vol. 51, no. 4, Jan. 27, 1920, pp. 131-134, 19 figs. Consideration is given to such characteristics as inverse-time-limit, definite-time-limit to control time of operation of relays, and use of relay switches to relieve relay contacts of handling heavy currents.

Service-Restoring. Protective and Service-Restoring Relays, Victor H. Todd. Power, vol. 51, no. 23, June 8, 1920, pp. 912-914, 7 figs. Service-restoring system is especially described, which will automatically reclose circuit-breaker a definite number of times after it has been tripped out.

[See also ELECTRIC DISTRIBUTION, Relay Installations.]

RESCUE APPARATUS

See BREATHING APPARATUS.

RESEARCH

Adjustment of Observations. The Adjustment of Observations, Norman Campbell. London, Edinburgh and Dublin Philosophical Mag., vol. 39, no. 230, Feb. 1920, pp. 177-194. Method, which is called method of zero sum and depending on principle that sum of large random collections of errors is zero, is maintained to be more practical and convenient than conventional method of least squares.

Aeronautical. See AERONAUTICS, Research.

Aeroplane Propellers. See AEROPLANE PROPELLERS, Research.

Alloys. See ALLOYS, Research.

Briquetting Plant. Experimental Briquetting Plant, Albert L. Stillman. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1035-1038, 4 figs. Outline of briquetting research work in General Briquetting Co.'s experimental plant.

Bureau of Mines. Description and Activities of the Pittsburgh Station, Bureau of Mines, E. E. Thum. Chem. & Metallurgical Eng., vol. 21, no. 7, Oct. 1, 1919, pp. 432-436, 7 figs. New laboratory building costing about $1,000,000 has been dedicated to service of public at Pittsburgh by Bur. of Mines. Its activities cover wide range of subjects of importance to chemical and metallurgical enterprise.

Cast Iron. See CAST IRON, Research.

Coal. See COAL, Research Work in; GAS INDUSTRY, Coal Research Work.

Colloids. See COLLOIDS, Research.

Concrete. See CONCRETE, Research.

Cotton Industry. See COTTON INDUSTRY, Research.

Egyptian Government Analytical Laboratory. Egyptian Analytical Laboratory and Assay Office, A. Lucas. Chem. Age (Lond.), vol. 3, no. 64, Sept. 4, 1920, pp. 256-257. Report on work of Government Analytical Laboratory and Assay Office during period of 1913-1919. Report emphasizes need of industrial research and of thoroughly up-to-date scientific library for general reference.

Electrical Engineering. See ELECTRICAL ENGINEERING, Research Problems.

Electrical, Need of. Electrical Research Needs Strong Support, Vladimir Karapetoff. Elec. World, vol. 75, no. 11, Mar. 13, 1920, pp. 603-604. Writer warns against thinking "that we can disregard the progress of science in Europe." Without mathematical research in physics and electrical engineering, he observes, we will be condemned "to gross empiricism and to a maze of experimental data without a rational interpretation and without a possibility of prediction of new phenomena or numerical values."

England. Report of First Conference of Research Organizations. Department of Scientific and Industrial Research. C. R. O. no. 1, July 29, 1919, 30 pp. Means of coöperating of various research organizations in British industries discussed.

Report of Second Conference of Research Organizations. Department of Scientific and Industrial Research, C. R. O. no. 2, Dec. 12, 1919, 30 pp., 1 fig. Development of research work in British industries.

Explosives. See EXPLOSIVES, Research.

Fiber Container Industry. Industrial Research in the Fiber Container Industry, J. D. Malcolmson. Chem. Age (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 321-323, 1 fig. Advantages and results of applying scientific research to industry.

Forging Industry. Place of Laboratory in Forging Industry, J. H. Nelson. Am. Drop Forger, vol. 6, no. 7, July 1920, pp. 316-319. Engineering responsibility and its relation to the forging industry. Discussion of common defects of steel, segregation, non-metallic inclusions, pipes, seams, flakes.

France. The Advancement of Science in France (Förderung der Wissenschaft in Frankreich), Kurt Sorge. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 36, Sept. 4, 1920, pp. 709-712. Notes on exigency of German science and research bureaus; France's plans for development of scientific research work. Remarks on Deputy Maurice Barrés's address before French Chamber in which comparison is made between German and French scientific creative power, inventive talent and organizing ability.

Frozen-Meat Industry. See FROZEN-MEAT INDUSTRY, Research.

Gas. See GAS, Research.

Glass. See GLASS, Research; GLASS INDUSTRY, Research.

Governmental Coöperation in. The Economic Importance of the Scientific Work of the Government, E. B. Rosa. Jl. Washington Acad. of Science, vol. 10, no. 12, June 19, 1920, pp. 341-382, 3 figs. Also in Sci. Monthly, vol. 11, nos. 1 and 3, July and Sept. 1920, pp. 5-24 and 246-253, 6 figs. Benefits to public resulting from governmental coöperation in industrial research are pointed out. Reasonableness of Government assisting and leading in research work is determined from analysis of present national budget, in which only one per cent of total is dedicated to research, education and development of municipal work. Government, it is concluded, should coöperate with industries in peace as earnestly and as effectively as industries coöperated with it in war.

Heating and Ventilation. See HEATING AND VENTILATION, Research.

Heat Treating. See HEAT TREATING, Research.

Hot-Air Furnaces. See FURNACES, HOT-AIR, Research.

Hydraulics. See HYDRAULICS, Research.

Industrial. Fifth Annual Report of the Committee of the Privy Council for Scientific and Industrial Research. Chem. News, vol. 121, no. 3156, Oct. 8, 1920, pp. 169-171. Activities of British Department of Scientific and Industrial Research. (Abstract.)

Industrial Research. Times Eng. Supp., no. 542, Dec. 1919, p. 367. Account of conference convened by Dept. of Sci. and Indus. Research with a view to exchanging views in regard to problems arising out of establishment and working of industrial organizations.

Industrial Research at the Mellon Institute, Wallace Savage. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 249-255, 11 figs. Attention is called to developments in bread, laundering, refractories, dental cements, magnesia insulations, insecticides, protected metals, paper containers, flotation, and testing of leather belting.

Industrial Research in Small Establishments, M. E. Leeds. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 690-692, 2 figs. Also in Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 1007-1008, 1 fig. and Science, vol. 50, no. 1298, Nov. 14, 1919, pp. 445-448, 1 fig. Plea for distinct department having its proper place as do other departments.

Science and the Industries, John J. Carty. Reprint & Circular Series of Nat. Research Council, no. 8, 16 pp., 2 figs. Address delivered under auspices of Nat. Research Council, Washington, D. C., Feb. 6, 1920.

The Engineer in Industry, Edward A. Deeds. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 331-333. Necessity for research in industry.

The Need of Research in the Industrial Field, P. F. Walker. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 487-491. Discussion of problems which await engineer in field of industry. Conditions which now exist in Kansas and neighboring states. An abstract of report prepared by Research Committee of Mid-Continent Section of Am. Soc. Mech. Engrs. is included.

The Organisation of Industrial Research. Eng. & Indus. Management, vol. 3, no. 25, June 17, 1920, pp. 769-779 and 787. Industrial laboratories are classified in three divisions: Works laboratories exerting analytical control over materials, processes and product; industrial laboratories working on improvements in product and in processes, tending to lessen cost of production and to introduce new products on the market; and laboratories working on pure theory and on fundamental sciences associated with industry. Organization required by each of these types is studied.

Industrial Laboratories. See LABORATORIES, Industrial; Photographic Research; Textile Research.

Industrial Wastes. Research and Industrial Wastes, George S. Hessenbruch. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 104-105. Plea made for research on subject and description given of research laboratory now contemplated for pursuing this type of investigation.

Internal-Combustion Engine for. See INTERNAL-COMBUSTION ENGINES, Research.

International Research Council. The International Organization of Scientific Research, George Ellery Hale. Int. Conciliation, no. 154,

Sept. 1920, pp. 431-441. Notes on International Research Council organized at International meeting held in Brussels, July 18-28, 1919.

Leather Industry. See LEATHER INDUSTRY, Research.

Malleable Iron. See MALLEABLE IRON, Research Work on.

Materials, Strength of. Some Engineering Necessities. Elecn., vol. 85, no. 2206, Aug. 27, 1920, pp. 229-230. Overhauling and revision of engineering theories of strength and suitability of materials is urged. Inaccuracies in theories as at present accepted are pointed out.

Metallurgical, Utah School of Mines. The Metallurgical Research Department of the Utah State School of Mines, L. W. Chapman. Chem. & Metallurgical Eng., vol. 22, no. 19, May 12, 1920, pp. 877-881, 5 figs. Station is used for general work in ore dressing, and researches of chloride volatilization and oil shales. Equipment is described.

Metals. See METALS, Progress in 1919.

Mine-Rescue Apparatus. See MINE-RESCUE APPARATUS, Research.

Miners' Lamps. See MINERS' LAMPS, Research.

National Research Council. Constructive Scientific Research by Coöperation, Burton E. Livingston. Science, vol. 51, no. 1316, Mar. 19, 1920, pp. 277-283. Slow progress of science is attributed to scientific research problems being attacked by individuals or by small, local groups of workers influenced by a single individual. It is suggested to organize system of coöperative research under auspices of National Research Council.

Fourth Annual Report of the National Research Council. Washington Government Printing Office, 1920, 68 pp. Council was established in 1916 at request of President of United States under charter of Natl. Academy of Sciences.

Non-Ferrous Metals. See NON-FERROUS METALS, Researches.

Observations, Adjustment of. The Adjustment of Observations, R. Meldrum Stewart. London, Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, no. 236, Aug. 1920, pp. 217-227. Criticism of method of deduction on observations offered as substitute for method of least squares by Dr. Norman Campbell in Philosophical Mag., Feb. 1920, p. 177.

Paper. See PAPER, Research.

Photobibliographic Methods. Photobibliographic Research Methods—The Compilation of Technical Data with the Aid of Photography, Arthur Worischek. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 679-682, 2 figs. Need for portable and cheaply operated photographic device for copying illustrations and articles on file in reference libraries is pointed out. It is believed that a device combining operating principles of existing bromide paper copying machines and self-illuminated meter-reading cameras would prove to be valuable aid in data compilation and simple enough in operation for use by non-technical clerical assistants.

Physical Chemistry. See PHYSICAL CHEMISTRY, Research in 1918.

Practical Laboratory Work in. Developing Laboratory Work Along Practical Business Lines, J. Edward Schipper. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 414-418, 6 figs. Organization of research department of Aluminum Castings Co.

Radiometallography. See RADIOMETALLOGRAPHY, Research.

Reduction of Observations. Adjustment of Parabolic and Linear Curves to Observations Taken at Equal Intervals of the Independent Variable, Harry M. Roeser. Dept. of Commerce, Sci. Papers of Bur. of Standards, no. 388, July 21, 1920, pp. 363-375. Ordinary least-square formulæ are subjected to mathematical treatment and rigorous solutions are evolved which require ultimate minimum of arithmetical work. Table is furnished from which large portion of solutions can be written down from mere inspection of observations. Application of solutions is made to typical problems and absolute check with ordinary least-square solutions is shown.

Refractories. See REFRACTORIES, Research.

Refractory Materials. See REFRACTORIES, Research.

Refrigeration. See REFRIGERATION, Research.

Rolling Mills. See ROLLING MILLS, Research.

Rubber. See RUBBER, Research.

Shipbuilding. See SHIPBUILDING, Research.

Social Evolution and. Research and Social Evolution, C. F. Hirshfeld. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 103-104. Writer pleads for material as well as economic research and particularly for sociological research, expressing opinion that basic knowledge and control of human relations have not kept abreast of social evolution.

Tables, Preparation of. The Rapid Preparation of Tables, J. C. Witt. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 591-592. Illustrates simplification of computation of results obtained in laboratory tests by constructing expression indicating progressional value of series.

Terrestrial Magnetism. See MAGNETISM, Terrestrial.

Textile Industry. See TEXTILE INDUSTRY, Research in.

United States. The Development of Research in the United States, James Rowland Angell. Reprint & Circular Series of Nat. Research Council, no. 6, 19 pp. Address delivered before Assn. of Land-Grant Colleges at Chicago, Nov. 13, 1919. Reprinted from Proceedings of Thirty-third Annual Convention of Assn. of Am. Agricultural Colleges & Experiment Stations.

Ventilation. See HEATING AND VENTILATION, Research.

RESERVOIRS

Bank Slides. Experiences with Bank Slides in Reservoirs (Einige Erfahrungen über Rutschungserscheinungen bei Stauseen), G. Lüscher. Schweizerische Bauzeitung, vol. 75, no. 12, Mar. 20, 1920, pp. 129-133, 2 figs. Writer refers to reply by Hans Roth to his former article on this subject, both published in previous issues of same journal, in which Roth gives as cause of bank movement when lake level is lowered the reduction of water pressure on the bank, whereas writer's theory is that movement is caused by increase in weight following decrease of buoyancy with repeated recharging and emptying. Writer gives account of experiences and facts to bear out his argument.

Concrete. Concrete Fuel Oil Reservoirs, H. B. Andrews. Oil News, vol. 7, no. 23, Nov. 20, 1919, pp. 15-17, 2 figs. Considerations in regard to location, size, shape, proportions and protection. Paper read before Am. Concrete Inst.

See also Dayton, Ohio.

Dayton, Ohio. The New 10,000,000-Gallon Flat Slab Roof Concrete Reservoir of Dayton, O. Eng. & Contracting, vol. 52, no. 20, Nov. 12, 1919, pp. 557-558. Notes on design and con-

struction. Paper presented before New England Water Works Assn.

The New Ten-Million-Gallon Reservoir of the City of Dayton, Ohio, Leonard Metcalf and William T. Barnes. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 219-256, 18 figs., partly on two supp. plates. Built of concrete with walls of gravity section, inverted groined arch floor with 8-in. crown thickness, and 26-in. reinforced-concrete cylindrical columns varying in length from about 20 ft. to 26 ft., supporting flat-slab concrete roof 8⅜ in. thick, reinforced with corrugated bars on two-way system.

Design. Design of an Octagonal Reservoir at Enid, Oklahoma, I. S. Siegrist. Eng. News-Rec., vol. 85, no. 1, July 1, 1920, pp. 36-37, 1 fig. Account of investigations made of economical depth of reservoir, shape and design of sections, for capacity of 2,000,000 gal. under present high-price conditions.

Natural, Determining Volume of. Determination of the Volume of a Natural Reservoir (Détermination du volume d'un réservoir naturel), A. Coutagne. Houille Blanche, vol. 18, no. 35-36, Nov.-Dec. 1919, pp. 222-227, 10 figs. Procedure is suggested for simplifying calculations involved in determining volume as arithmetical mean of values found from method of consecutive horizontal traces and method of consecutive vertical profiles.

North Carolina. Master Storage Reservoir for Southern Power Company's System, W. S. Lee and Richard Pfaehler. Elec. World, vol. 75, no. 23, June 5, 1920, pp. 1299-1303, 10 figs. Features of Bridgewater reservoir which provides storage for seven hydroelectric plants of Southern Power Co. and details of 25,000 kva. Bridgewater Station at this reservoir.

Oil, Cement Lining for. Note on the Manufacture and Use of Cement Concrete Blocks for Lining Large Liquid Fuel Reservoirs on the North-Western Railway, N. Pearce. Indian Eng., vol. 67, no. 5, Jan. 31, 1920, pp. 66-68, 4 figs. on supp. plate. Mixture used for blocks was 1 2-4 by volume. Final coating of cement plaster was laid over surface of block lining.

Repairing. Repairing a Damaged Reservoir. Public Works, vol. 48, no. 5, Feb. 14, 1920, pp. 96-97, 1 fig. Describes how a 1½-in. crack crossing an entire reservoir, located in England, was repaired by uncovering bottom rock and placing over the crack a slab of reinforced concrete encased in sheet of asphalt, on top of which was relaid original bottom lining.

Spillways for. Spillways for Reservoirs and Canals, A. T. Mitchelson. U. S. Dept. of Agriculture, bul. no. 831, Aug. 25, 1920, 40 pp., 37 figs. Advantages of siphon spillway.

Volume Determination. Determination of Volume of Dam Reservoirs for Hydraulic Plants (Die Bestimmung des Stauinhaltes bei Talsperren für Wasserkraftanlagen), Johannes Wörner. Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 4, Feb. 10, 1920, pp. 44-46, 3 figs. Gives diagrams and works out illustrative calculations.

Water Level, Measurement of. The Pneumercator. Elec. Times, vol. 58, no. 1504, Aug. 12, 1920, pp. 128-129, 3 figs. Apparatus for measuring height of water in reservoirs. Also applicable to any other liquid. Device is used in U. S. Navy for oil-tank readings.

RESILIOMETER

See PLASTIC MATERIALS, Softening of.

RESISTANCE

Electric. See ELECTRIC RESISTANCE.

RETAINING WALLS

Concrete. Concrete I-Beams Used to Make Crib Retaining Wall. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 651-652, 4 figs. Experience of railroad is said to have shown that concrete structure combines flexibility of wood crib with permanence of concrete.

Reinforced Concrete Retaining Walls Without Buttresses, E. R. Matthews. Concrete & Construction Eng., vol. 15, no. 9, Sept. 1920, pp. 599-602, 3 figs. Gives typical example illustrating how to design reinforced concrete retaining wall, without buttresses, 17 ft. high above foundation slab, to retain sand moderately dry for full height of wall.

The Most Economic Form of the Reinforced-Concrete Angle-Section Retaining Wall (Die wirtschaftlichste Form der Eisenbeton-Winkelstützmauer), Karl Kabelac. Beton u. Eisen, vol. 18, no. 19-20, Dec. 4, 1919, pp. 218-221, 4 figs. A supplement to work under same title by G. Gilbrin published in same journal in 1912 (p. 233), presenting formulæ for computing minimum width of base of a reinforced-concrete angle-section retaining wall.

Gravity Type. Some Features of Gravity Retaining Walls, S. W. B. Black. Can. Engr., vol. 39, no. 8, Aug. 19, 1920, pp. 259-262, 2 figs. Types of failure to be guarded against. Top width, batter and stepping of back; extending the toe; **drainage; expansion joints; careful** depositing of back filling.

Large Buildings. Retaining Walls for Large Buildings. Concrete & Constructional Eng., vol. 15, no. 3, Mar. 1920, pp. 155-160, 5 figs. Instead of customary procedure of excavating whole area, trenches were dug against road frontages to accommodate retaining walls, sufficient amount of earth being left against backs of street frontage to render them self-supporting.

Overturning Moment. Overturning Moment of Retaining Walls, Angus Robertson Fulton. Eng., vol. 109, no. 2825, Feb. 20, 1920, p. 254. Results of experiments for investigating pressure of earth on retaining walls. Abstract of paper read before Instn. C. E.

[See also EARTH, Pressure.]

REVETMENTS

See CONCRETE BLOCKS, Casting.

RHEOGRAPH

See FLOW OF WATER, Flow Recorder.

RHEOSTATS

Liquid. The New Liquid Rheostats for the Norfolk & Western Railway, D. C. West. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 483-484. Rheostat for each truck consists of two electrode assemblies, of three electrodes each, mounted side by side in rectangular tank, which is provided with set of weirs for raising and lowering height of electrolyte around electrodes.

RIFLE BARRELS

Physical Properties. Physical Properties in Rolled Rifle Barrels, F. L. Moister. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1025-1026, 3 figs. Tests are said to have confirmed theory that as reductions increase and temperatures decrease the tensile strength and elastic limit are increased proportionately.

RIFLES

See GUNS, Bore, After-Corrosion of.

RIPARIAN RIGHTS

Retention by State. Riparian Rights, J. Spencer Smith. Freight Handling & Terminal Eng., vol. 6, no. 9, Sept. 1920, p. 334. Contrast is

made between developments at Montreal and New Orleans, where riparian rights have been retained by state, and Jersey City, N. J., where riparian rights have not been so retained. More scientific developments on former ports is attributed to retention of such rights. Paper read before Am. Port Authorities, Chicago, Sept. 1920.

RIVER VESSELS

Coal Barges. Material for Construction of Coal Barges (Note sur le matériel de la batellerie). Bulletin technique du Bureau Veritas, vol. 2, no. 9, Sept. 1920, pp. 179-182, 3 figs. Coal barges employed for canal transportation of coal from Sarre district. Dimensions are: Length between perpendiculars, 38.35 m.; breadth, 5 m.; mean depth, 2.7 m.

RIVERS

Bank Protection. A New Type of River Current Retards. Ry. Maintenance Engr., vol. 16, no. 2, Feb. 1920, pp. 67-70, 8 figs. Flexible rafts constructed by Chicago, Burlington & Quincy Rd. to protect river banks from cutting.

Flexible Rafts Protect River Banks from Cutting. Ry. Age, vol. 68, no. 12, Mar. 19, 1920, pp. 945-948, 8 figs. Current retards installed on Missouri River by Chicago, Burlington & Quincy.

See also LEVEES.

Flow of, Study. Stream Gauging Methods and Uses. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 168-169. Study of flow of Naugatuck River, Conn., together with run-off of its drainage area, in connection with chemical and bacteriological examination of water for ascertaining extent of pollution, and for estimating developed water power of mills and quantity available for storage.

Form of Bed. Geometrical Form of Rivers, L. Fargue. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 446-447, 3 figs. Technical notes on design of spur dikes. Translated from Annales des Ponts et Chaussées, 1903 and 1907.

Improvement. Construction of Lock D, Cumberland River, Rufus W. Pafford. Military Engr., vol. 12, no. 61, Jan.-Feb. 1920, pp. 13-20 and 77 and (discussion) pp. 77-78. Details of design and construction of one of the six locks comprising project for improvement of that part of river from Nashville, Tenn., to mouth, called Lower Cumberland.

Levee Construction, Dayton, O. High-Speed Block-Laying on Miami River Levees. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 248-249, 1 fig. Flexible concrete mattress construction by stringing precast concrete blocks on steel cable being done in improving channel of Miami River at Dayton, Ohio.

Mississippi, Mouth of. An Open Mouth for the Mississippi River, Allen E. Washburn. Proc. Louisiana Eng. Soc., vol. 6, no. 1, Feb. 1920, pp. 17-32 and (discussion) pp. 32-41. Survey of work done to maintain navigable entrance to New Orleans, and visualization of probable future developments.

Monongahela, Navigation of. See NAVIGATION, INLAND.

Pollution. See STREAM POLLUTION, Niagara River.

Potomac. Developing Power of the Potomac River, John C. Hoyt. Elec. World, vol. 76, no. 9, Aug. 28, 1920, pp. 421-422, 1 fig. It is estimated that 61,000,000 kw.-hr. may be obtained annually for District of Columbia by providing adequate storage.

Regulation. Improvement Work on River Murray in South Australia, Robert C. Cutting. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 244-246, 6 figs. Regulation of longest river on island for navigation by locks and dams.

See also HYDRAULICS, Manning Formula.

Rhone. French Government to Regulate River Rhone, Thorndike Saville. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 396-399, 6 figs. Proposed $300,000,000 project will develop water power, improve navigation and provide water for irrigation.

Run-Off. Inspections and Test of Run-Off Records, C. H. Pierce. Cornell Civ. Engr., vol. 28, no. 4, Jan. 1920, pp. 164-169. Records of stream flow are divided into two classes, namely, open-channel gaging stations and stations at dams and power plants. These two methods are described and their advantages and disadvantages pointed out.

The Probable Variations in Yearly Run-Off as Determined from a Study of California Streams, L. Standish Hall. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, p. 950, Data of California streams are studied with a view to constructing probability graph on which, by means of straight-line relation, probable minimum and maximum yearly run-offs which are likely to occur once in a period of 100 years may be determined for any stream from available run-off data for that stream. (Abstract.)

Scioto, Improvement of. The Improvement of the Scioto River Channel at Columbus, Ohio, as a Means of Flood Relief, R. H. Simpson. Cornell Civ. Engr., vol. 28, no. 4, Jan. 1920, pp. 157-163, 1 fig. Project in general is said to consist of widening and improving present channel of river. New levees are said to be all laid out on curves connected by tangents, radii of curves ranging from 1200 to 5200 ft. in length.

Stream-Flow Measurement. The Development and Use of the Long Distance Water-Stage Recorder, Roger C. Rice. Eng. & Contracting, vol. 53, no. 23, June 9, 1920, pp. 647-648, 6 figs. Description and illustrations of apparatus at the U. S. Geol. Survey's stream-flow measuring station on Kansas River at Topeka, Kan.

[See also FLOOD CONTROL; RIPARIAN RIGHTS.]

RIVETED JOINTS

Design. The Design of Riveted Joints, James Montgomerie. Eng. & Indus. Management, vol. 3, no. 18, Apr. 29, 1920, pp. 547-548, 1 fig. Information based on experiments carried out at instance of Committee of Lloyd's Register of Shipping concerning physical qualities of riveted joints. Paper presented before Instn. Engrs. & Shipbuilders in Scotland.

Moment-Resisting. Design of Riveted Connections to Resist Moment, W. M. Wilson and F. E. Richart. Eng. & Contracting, vol. 53, no. 21, May 26, 1920, pp. 590-592, 4 figs. Writers present design of specific types of connections, preceded by assumption as to stress distribution upon which design of all types of moment-resisting connections is based.

Stress Determination in. Determination of Surface-Distortion and Stress Conditions and Its Application to a Plate Stressed by Two Rivet Bolts (Ermittlung ebener Verschiebungs- und Spannungszustände und Anwendung auf eine durch zwei Nietbolzen gespannte Platte), Dietrich Rühl. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 29, July 17, 1920, pp. 549-554, 11 figs. Based on general theories of the distribution of force in riveted tension-resisting joints, a problem of special importance in structural work is solved by author. Description of apparatus used for purpose which, it is claimed, can be used for investigation of every biaxial stress condition.

RIVETING

Electric Machine for. The "Remca" Electric Riveting Machine. Eng., vol. 109, no. 2836, May 7, 1920, pp. 625-626, 6 figs. Patented machine manufactured by Mada Eng. Co., Ltd., Liverpool.

Electric Rivet Heaters. An Electric Rivet Heater. Eng., vol. 110, no. 2856, Sept. 24, 1920, p. 408, 1 fig. Apparatus consists of simple framework on wheels for carrying transformer. It is constructed by A.1 Manufacturing Co., Bradford, England.

Heating Rivets without Fire, Ellsworth Sheldon. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 701-706, 16 figs. Berwick electric rivet heater.

RIVETS

Initial Tension in. See BOLTS, Initial Tension in.

Manufacture. Improved Rivets at Less Cost, Letson Balliet. Pacific Mar. Rev., vol. 17, no. 8, Aug. 1920, pp. 92-93, 5 figs. Description of method of manufacture employed by Moore Shipbuilding Company, using gas-heated furnaces.

ROAD CONSTRUCTION

Adjusting Earth Excavation. New method for Adjusting Earth Excavation and Determining Haul, J. W. Ball and C. R. Shore. Can. Engr., vol. 39, no. 10, Sept. 2, 1920, pp. 297-299, 6 figs. Graphical methods based on "quantities" diagram and "excess area" diagram.

Concreting Machinery. See ROADS, CONCRETE, Machinery.

Cost Estimating. Standard Form for Estimating Costs of Highway Work. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 511-512. Gives a standard estimate sheet intended to include or suggest all items which might be considered as proper cost charge in any of operations which are likely to occur in road and bridge work in Wisconsin, developed by committee working under direction of state highway department; and explanatory remarks offered by the committee regarding preparation and use of sheet.

Federal Aid. For What Class of Roads and What Type of Construction Should Federal Aid Funds be Used? Thomas H. MacDonald. Good Roads, vol. 19, no. 15, Apr. 14, 1920, pp. 199-200 and 203. Writer expresses opinion that "federal aid funds should be expended, either for the low-cost types in the building of which machinery is used practically altogether, or for the higher-cost roads, for which machinery, if not already developed, is rapidly being developed."

Financing. The Motor Vehicle's Share in Highway Construction and Maintenance Cost, S. E. Bradt. Public Roads, U. S. Dept. of Agriculture, Bur. Public Roads, vol. 2, no. 20, Dec. 1919, pp. 21-23. Plans followed in Illinois, Iowa and Georgia.

France, A. E. F. The Road Work of the A. E. F. Good Roads, vol. 19, no. 19, May 12, 1920, pp. 241-243, 5 figs. Sketch of development of road construction and maintenance forces of American armies, kind and extent of work, and equipment. From historical report of chief engineer, A. E. F.

Illinois. Highway Work in Illinois. Good Roads, vol. 20, no. 14, Oct. 13, 1920, pp. 179-180. 49 miles were completed during September on Federal Aid System which involves construction of 225 miles. $2,881,504 bridge and grading contracts were let.

Machinery for. Developments in 1919 in the Uses of Machinery for Highway Construction. Contract Rec., vol. 34, no. 9, March 3, 1920, pp. 204-207. Progress made in determining types of plant adapted to rapid and economical construction is pointed out, and also increase use of motor trucks and tractor-trailers for material haulage.

Developments in 1919 in the Use of Machinery for Highway Construction, C. S. Hill. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 8-10. Progress made in determining types of plant adapted to rapid and economical construction. Increase in use of motor trucks and tractor-trailers for haulage of materials is noted.

Road Machinery, Arthur H. Blanchard. Can. Engr., vol. 38, no. 23, June 3, 1920, pp. 521-522. Discussion of various machines used in grading operations, and in construction and maintenance of earth, sand-clay, gravel and broken stone roads, including carts and wagons, plows, drag, wheel and buck scrapers, road and elevating graders, steam shovels, rollers, scarifiers, etc. Paper read before Can. Good Roads Convention.

Middle Atlantic States. Review of Highway Construction Conditions in Middle Atlantic States. Eng. & Contracting, vol. 53, no. 5, Feb. 4, 1920, pp. 138-139. Abstract of report by Samuel Knopf presented at Am. Assn. of State Highway Officials. Approximately 1900 miles under construction during 1919, writer states, and $75,000,000 expended to carry on work.

Motor-Truck Haulage in. Economy and Labor Saving Methods Necessary in Highway Work, Harry Wilkin Perry. Good Roads, vol. 19, no. 5, Feb. 4, 1920, pp. 53-56, 4 figs. Illustrates uses of trailers and motor trucks in road building.

Motor-Vehicle License Fees for. Relation of Motor-Vehicle License to Highway Construction, S. E. Bradt. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 73-74. Writer believes that raising of funds by license fee to be paid by individuals who use highways and receive large benefits from them is "an equitable and proper source of revenue, and the benefit is so pronounced that motorists stand ready to offer this assistance."

Newark-Jersey City Turnpike. Newark Turnpike Improvement. Public Works, vol. 48, no. 20, May 29, 1920, pp. 459-463, 2 figs. Describes construction of 3½ mi. 40-ft. main highway between Jersey City and Newark. Notes on eliminating grade crossings; longitudinal and transverse drainage on level alignment; making 300,000-yd. embankment on marsh, duplex concrete plant, etc.

New York State. State Highway Construction in New York, James H. Sturdevant. Public Works, vol. 48, no. 11, Mar. 27, 1920, pp. 243-244. Writer describes approved methods of building a concrete highway; placing concrete, leveling, screening and belting; making expansion joints and curing surface, providing water supply, building bridges, culverts and retaining walls. Standard construction equipment is enumerated and character of engineering supervision and inspection defined.

Progress in 1919. County Highway Data. Public Works, vol. 48, no. 12, Apr. 3, 1920, pp. 276-287. Tabulated data on county highway work done during 1919, practice as to road shoulders, resurfacing county highways and maintenance of waterbound macadam county highways.

Sampling. Sampling Highway Pavements, F. A. McLean. Good Roads, vol. 20, no. 5, Aug. 4, 1920, pp. 53-54 and p. 60, 3 figs. Necessity of uniformity and regularity of samples. Disadvantages of hand cutting. Core-drilling methods and tools. Typical outfits.

Specifications for Ashokan Highways. Construction and Maintenance of the Ashokan High-

ways, George G. Honness. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 652-657, 4 figs. Specifications for mixed bituminous concrete, vitrified brick on concrete foundation, waterbound macadam, and asphalt block roads within area of Ashokan reservoir, located in foothills of Catskill Mountains, which is principal impounding reservoir for New York's Catskill water supply.

Storm King Highway. Storm King Highway. Public Works, vol. 48, no. 12, Apr. 3, 1920, pp. 263-269, 10 figs. Details of construction of $750,000 road about four miles long, terraced in previously inaccessible steep rocky faces of two rugged mountains where vertical cuts 170 ft. deep were blasted directly over West Shore railroad tracks to secure a narrow roadway without bridges or tunnels 400 ft. above Hudson River.

Surfacing. See ROADS, MACADAM, Surfacing.

Top-Soil Base. Value of Top Soil as Base for Modern Highways, D. S. Humphrey. Eng. News-Rec., vol. 84, no. 12, Mar. 18, 1920, pp. 566-567. It is recommended that earth's crust be unmolested and that side ditching be avoided.

Traffic During. Taking Care of Traffic During Construction, C. R. Weymouth. Eng. & Contracting, vol. 53, no. 2, June 2, 1920, pp. 630-631. Abstract of address presented at road school of Wisconsin Highway Commission, in which writer sets forth that only condition justifying the closing of main-traveled roads is when there is no other possible way out and then for briefest time possible.

United States, 1919-1920. State Highway Construction in 1919 and 1920. Eng. & Contracting, vol. 53, no. 5, Feb. 4, 1920, pp. 119-124. Construction in 1919, probable construction in 1920 and average unit contract prices in 1919 in New England, Middle Atlantic, South Atlantic, East North Central, East South Central, West North Central, West South Central, Mountain and Pacific Coast states.

Winter Construction. Winter Road Work in the Dakotas, Minnesota, and Wisconsin a Success, E. G. Edwards. Public Roads, vol. 3, no. 25, May 1920, pp. 7-10, 5 figs. Advantages claimed for building roads in winter are (1) greater accessibility of pits, (2) larger number of teams available and (3) lengthening of construction period.

Wisconsin. Wisconsin Standardizes Highway Cost Estimates. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 663-664, 1 fig. Standard bidders' estimating form prepared for use of state highway engineers in estimating cost of improvements and for use of contractors in preparing bidding prices for construction.

ROAD MATERIALS

Oils, Asphalt Content of. The So-Called Asphalt Content of Road Oils, B. A. Anderton and D. G. Taylor. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 7 pp. 1 fig. Investigation of Bur. of Public Roads of value of determining asphalt of 100 penetration in road oils in differentiating between various types and consistencies of oils. As a general conclusion, it is believed that percentage of asphalt gives no information on suitability of a road oil for a given purpose that is not adequately indicated by other well standardized tests.

Standard Specifications. Proposed Standard Specifications for Road Building Materials. Rock Products, vol. 23, no. 15, July 17, 1920, pp. 31-33. Proposed methods for testing quantity of clay and silt in sand and gravel; standard sizes of crushed stone, sand and gravel; methods for sampling crushed stone, sand, gravel and slag; and specifications for crusher-run slag for macadam roads. Specifications proposed at convention of the Am. Soc. for Testing Materials.

Testing. Road Materials. Report of Committee D-4 Annual Meeting, Am. Soc. Testing Matls., June 22-25, 1920, 44 pp., 2 figs. Tests are suggested for specific gravity of road oils, road tars, asphalt cements and soft tar pitches and for quantity of clay and silt in gravel for highway construction; also for proportions for concrete for highway construction.

ROAD ROLLERS

Steam vs. Electric. Power Road Rollers (Motor-Strassenwalzen), H. Jacoby. Allgemeine Automobil-Zeitung, vol. 21, no. 33, Aug. 14, 1920, pp. 24-26, 4 figs. Describes various new types and gives data of comparative costs of 12-ton steam roller and 6 to 8-ton electric roller.

ROAD TRACTION

Present Status. The Present Position of Mechanical Road Traction, C. G. Conradi. Jl. Instn. Mech. Engrs., no. 9, Dec. 1919, pp. 661-701 and discussion, pp. 702-706, 53 figs., partly on eight supp. plates. Comparative study of costs of steam, gasoline and electric traction. Problems of goods transportation are classified and economical operation by one of these three systems of traction is determined for each.

ROADS

Administration. General Principles of Road Administration, R. W. Acton. Eng. & Contracting, vol. 52, no. 19, Nov. 5, 1919, pp. 538-539. Economic and political elements in administration of building and maintenance. Paper presented before Engrs.' Club of Northern Minn.

American Highway Problems. Modern Highway Problems, E. W. James. Can. Engr., vol. 38, no. 6, Feb. 5, 1920, pp. 193-194. Excerpts from address read before Eng. Inst. of Can., in which writer suggests uniform laws for controlling vehicles, refers to technical problems of modern traffic, importance of drainage, and exact effect of impact.

The American Highway Problem, A. R. Hirst. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 258-262. Also in Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 856-860. Warns against spending millions for public works with "little thought of the organizations necessary to expend them properly." Presidential address before Am. Assn. State Highway Officials.

Bituminous. See ROADS, BITUMINOUS.

Bituminous Surfacing of. Bituminous Surface Treating Work, D. O. Stone. Cornell Civ. Engr., vol. 28, no. 4, Jan. 1920, pp. 170-178, 7 figs. In 1911 a Maintenance and Repair Bureau was organized to take care of system of state roads. Details of organization and equipment; illustrations of forms used by Department.

Brick. See ROADS, BRICK.

Broken-Stone. The Broken Stone Road is a Valuable Type, Geo. Hogarth. Contract Rec., vol. 34, no. 24, June 16, 1920, pp. 577-578. Among its advantages is mentioned that it does not require rigid or expensive inspection and can be laid in all but freezing weather.

Concrete. See ROADS, CONCRETE.

Construction. See ROAD CONSTRUCTION.

Curves. Alignment, Grade and Width of Modern Highways, Chas. M. Upham. Eng. & Contracting, vol. 53, no. 5, Feb. 4, 1920, pp. 140-141. Writer claims that when curve sharper than 24 deg., or of 1433 ft. radius, is used, roadway should be elevated on outer side and widened on inner side. Belief is expressed

that 6 per cent grade established in days of horse-drawn vehicles is not necessarily most economic for motor vehicles.

See also RAILWAY TRACK, Curve Computation.

Design. The Design of Modern Road Surfaces, with Especial Reference to Alignment, Grade, Width and Thickness, Charles M. Upham. Mun. & County Eng., vol. 58, no. 1, Jan. 1920, pp. 12-16. Difference is drawn between scenic roads where "straight line is not absolutely necessary but all importance should be laid on safety," and commercial roads where "straight line is ideal and all roads should approach this alignment."

Earth. See ROADS, EARTH.

Expenditures in 1918 in U. S. Highway Expenditures in the Year of 1918, Andrew P. Anderson. Good Roads, vol. 18, no. 15, Oct. 8, 1919, pp. 171-174 and 176. Data compiled by Bureau of Public Roads indicate total expenditure of $300,000,000 on rural roads.

Federal Aid for. Federal Control and Aid for Highways—Its Results, Merits and Limitations, Thos. H. MacDonald. Public Roads, vol. 2, nos. 21-22, Jan.-Feb. 1920, pp. 10-14. Writer who is chief of U. S. Bur. of Public Roads summarizes most important modifications which it seems now necessary to make in order that present Federal-aid law may meet satisfactorily the national need for improved roads.

France. The Roads of France, Henry Welles Durham. Good Roads, vol. 19, no. 8, Feb. 25, 1920, pp. 109-114, 10 figs. Writer maintains that three principal points which have served to give French roads their preëminence are: (1) National system of control, removed from political changes; (2) complete plan and original layout adequate today with few exceptions; and (3) continuous maintenance.

Grades. Capacity Load and Ruling Grade in Highway Transportation, R. C. Barnett. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 637-638, 3 figs. Graphs indicating effect of grades in reduction of trailer loads.

See also Curves.

Gravel. See ROADS, GRAVEL.

Hard-Surfaced. Hard Surfaced Roads, E. J. Wulff. Better Roads and Streets, vol. 9, no. 9, Sept. 1919, pp. 293-294, 317 and 320. Also in Good Roads, vol. 18, no. 18, Oct. 29, 1919, pp. 195-196, 2 figs. Discussion of various types relating to the principles which should govern construction of hard surfaced pavements. Paper read before North Carolina Good Roads Assn.

Heavy Traffic. Relation of Tractors and Trailer Traffic to Highway Design, H. Eltinge Breed. Can. Engr., vol. 38, no. 22, May 27, 1920, p. 510. Writer points out that in uncertainty of highway design, motor transportation suffers serious check, and states that in spring of 1920 improved roads went to pieces as never before, because they are organically wrong and not designed for loads they must bear. Paper read before Nat. Highway Traffic Assn.

Roads for Modern Transport Requirements, H. T. Chapman. Can. Engr., vol. 38, no. 22, May 27, 1920, pp. 508-509. Necessary adjuncts to all good roads are said to be subsoil and surface water drainage, adequate foundation, lateral support, and suitable surfacing, and each of these are discussed. Paper presented before Municipal & County Engrs. of Great Britain.

Impact Tests. The Present Status of Impact Tests on Roadway Surfaces, A. T. Goldbeck. Public Roads, U. S. Dept. of Agriculture. Bur. Public Roads, vol. 2, no. 18-19, Oct.-Nov. 1919, pp. 19-25, 3 figs. Also in Jl. Soc. Automotive Engrs., vol. 6, no. 4, Apr. 1920, pp. 265-269, 11 figs.; Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 37-43, 13 figs.; Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 651-652; Power Wagon, vol. 24, no. 183, Feb. 1920, pp. 41-44, 10 figs. Account of experiments being conducted by Bureau of Public Roads with a view to determining fundamentals affecting road design. Highest value of impact pressure so far measured is 42,000 lb. when weight on rear wheel causing this pressure was only 7750 lb.

Macadam. See ROADS, MACADAM.

Maintenance. Heavy Motor Transport and Road Construction. Engineering, vol. 108, no. 2814, Dec. 5, 1919, pp. 768-772. Symposium of weight, construction and speed of mechanically-propelled vehicles in relation to construction and maintenance of roads at Road and Transport Congress of County Councils Assn.

State Highway Maintenance in New York. Public Works, vol. 49, no. 7, Aug. 14, 1920, pp. 143-146, 5 figs. Exceptionally heavy truck traffic during unusually wet spring resulted in total destruction of thousands of feet of high-grade bituminous concrete and asphalt block on highways north of New York City. How temporary repairs, and later permanent ones, were made by state highway forces is described.

Wisconsin Experiences in Road Building and Maintenance, A. R. Hirst. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 509-510. Notes on patrol system of maintenance, and gravel road construction. Application of 2 to 3 in. of sand on clay is said to produce good road. Writer who is state highway engineer of Wisconsin describes three types of roads being built and maintained. Abstract of address before Ontario Good Roads Assn.

See also TRAILERS, Folding Camp.

Maintenance Costs. Maintaining County Highways. Public Works, vol. 48, no. 20, May 29, 1920, pp. 476-481. Tabulated data from counties in many states as to cost of maintaining their earth, gravel, concrete, brick, bituminous macadam and bituminous concrete highways, with mileage and traffic of each.

Materials. See ROAD MATERIALS.

Military. Roads in Supply and Attack, W. G. Caples. Prof. Memoirs, Corps of Engrs. U. S. Army & Engr. Dept. at Large, vol. 11, no. 60, Nov.-Dec. 1919, pp. 650-674, 4 figs. Experience of A. E. F. is related and from it diagrammatic study is made of minimum road requirements of a fighting corps.

See also ROAD CONSTRUCTION, France, A. E. F.

Paved, Installment Construction. Paved Roads Built in Installments From Dirt Roads. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 1008-1009. Plan followed at Iowa.

Signs and Signals. See STREETS, Signs and Signals.

Snow Removal. See SNOW REMOVAL, Highways.

Surfaces. The Alignment, Grade, Width, and Thickness in Design of Road Surfaces, Chas. M. Upham. Public Roads, vol. 2, nos. 21-22, Jan.-Feb. 1920, pp. 24-30. Discusses general problem of design, factors to be considered with regard to alignment, laws of traffic in relation to width, and betterment of subgrade which, it is said, controls thickness. Discussion of paper by F. R. Rogers.

Surfacing. Bituminous Surface Treatment, M. C. Welborn. Good Roads, vol. 19, no. 23, June 5, 1920, pp. 287-290. Practice of Texas State Highway Dept.

Types of Surfacing for Light and Medium Traffic Roads, C. L. Moth. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, p. 650. Used in Minnesota where subgrade materials

are principally either heavy clay or black loam.

Tarred. See ROADS, TARRED.

Traffic, Effect on. New Highway Investigations of the Bureau of Public Roads, A. T. Goldbeck. Eng. & Contracting, vol. 53, no. 2, June 2, 1920, pp. 635-636. Results of investigations of impact delivered by motor trucks to roads, effect of impact on different types of road surfaces, effect of traffic on different types of road surfaces, and bearing value of subgrades as affected by moisture. Paper presented before Am. Road Builders' Assn.

[See also DRAINAGE, Open Ditches vs. Tile Drains; HIGHWAYS; PAVEMENTS.]

ROADS, ASPHALT

Foundations for. Foundations for Asphaltic Pavements, John C. Wilson. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 85-86. Concrete vs. asphaltic foundations.

ROADS, BITUMINOUS

Asphaltic Concrete. Asphaltic Concrete Laid on Gravel Base, E. F. Petersen. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 277-280, 1 fig. Experience in Arkansas is said to have proven successful.

Maintenance. Bituminous Road Maintenance in Rhode Island, M. M. Cranston. Good Roads, vol. 19, no. 3, Jan. 21, 1920, pp. 25-26, 2 figs. Maintenance organization of State Board of Public Roads and methods employed in work by section gangs. Costs of work.

Sub-Grade. Need for Sub-Grade Study Evidenced in Road Upheavals. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 310-312, 4 figs. New Jersey experience with asphalt type.

Upheavals Due to Frost Action. See Sub-Grade.

[See also ROADS, MACADAM, Bituminous.]

ROADS, BRICK

Beam Strength in. Is Beam Strength the Important Item in Brick Roads? Will P. Blair. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, pp. 699-700. It is claimed practice shows beam strength is not essential.

Economy of. The Economy of Brick Street and Road Construction, Will P. Blair. Clay-Worker, vol. 72, no. 5, Nov. 1919, pp. 440-441. Advises against building curve in brick-paved country roads. Paper read before Am. Soc. for Mun. Improvements.

Types and Records of Service. The Construction of Brick Pavements in and Near Danville, Illinois, Harlan H. Edwards. Mun. & County Eng., vol. 58, no. 1, Jan. 1920, pp. 3-8, 12 figs. Survey of types of pavements in use and records of their service. In particular it is mentioned that monolithic brick 9-ft. wide and 6 miles in length, which was built in 1916, by using 4-in. brick laid on 1-in. bed of fine gravel concrete has given very satisfactory service.

ROADS, CONCRETE

California. Reinforcing Concrete Pavements on California Highways. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, p. 1255, 1 fig. Transverse bars used to prevent cracks from widening and to maintain surface continuity.

Construction. Central Mixing and Proportioning Plants in National Old Trails Road Construction in Illinois. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 339-342, 13 figs. Comparison of two methods of handling concreting, in central mixing plant or in central proportioning plant, based on experience of contractors who have used these two methods in road construction work in Illinois.

Concrete Road Contract Has Plant for Rapid Progress. Eng. News-Rec., vol. 84, no. 1, Jan. 1. 1920, pp. 28-31, 5 figs. Plant for building 9-mile stretch of Lincoln Highway in Illinois comprised system for loading batch boxes, revolving crane traveling on concrete mixer of high capacity and large machinery equipment.

Details of Inspection and Construction in Concrete Highway Work, H. Eltinge Breed. Am. City, Town & County Ed., vol. 21, no. 4, Oct. 1919, pp. 305-309, 1 fig. Concerning manner of testing fine aggregate for organic impurities, gradation, mortar strength, and volume of silt or loam.

Efficient Concrete Road Building Organization, Kane County, Ill., E. S. Hanson. Concrete, vol. 15, no. 5, Nov. 1919, pp. 177-179, 6 figs. How stretch of 21 miles on Lincoln Highway, in Kane County, Ill., is being built.

Fast Roadbuilding with Concrete Hauled Four Miles. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 280-281, 5 figs. Sketch plan of central mixing plant and truck system for building 6-mile road.

Recent Developments in Concrete Highway Construction, A. N. Johnson. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 204-206. Concerning grading of aggregate, determining amount of water to use, methods of finishing, and uses of machinery and reinforcement.

The Cement Concrete Road, W. P. Near. Can. Engr., vol. 38, no. 25, June 17, 1920, pp. 567-570. Notes on preparation and care of sub-grade before placing concrete, specification for consistency, size and quality of aggregates, etc. Includes Prof. Abrams' tables of proportions and quantities for 1 cu. yd. of concrete. Paper read before Can. Good Roads.

The Industrial Railway in Road Work. Good Roads, vol. 19, no. 17, Apr. 28, 1920, pp. 217-218, 2 figs. Equipment used by contractors in Illinois and Michigan in construction of concrete roads.

Construction Equipment. Equipment for Concrete Road Construction, B. H. Piepmeier. Eng. & Contracting, vol. 53, no. 9, Mar. 3, 1920, pp. 230-233, 12 figs. Writer enumerates machines that he considers generally essential to insure economical results as follows: Mechanical tamping and finishing machine, power subgrading device, duplex pumping unit, power roller with scarifier attachment where possible, 1-bag mixer for bridge and culvert construction, etc.

Delaware. Concrete Road Construction Methods on Contract No. 8 of the Du Pont Highway, Delaware, George A. Sherron. Eng. & Contracting, vol. 53, no. 14, April 7, 1920, pp. 402-404, 5 figs. Construction of road for distance of six and one-half miles. Road is of 1-course cement concrete, mixed in proportions of 1 part cement, 2 parts fine aggregate and 4 parts coarse aggregate, to which 10 per cent by volume of hydrated lime is added.

Design and Construction. Recent Developments in Concrete Road Construction, A. N. Johnson. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 514-518, 2 figs. Notes on subgrade, coarse aggregate tests and tests of sand for organic impurities, consistency, proportions for mixing concrete, etc. Gives Abrams' tables of proportions and quantities for 1 cu. yd. of concrete, and instruction for practical application of table, and example of use of table. Abstract of paper presented before Am. Road Builders' Assn.

Hauling Materials. Wet Haulage to Road Excels Dry Haulage to Mixer. Eng. News-Rec., vol. 85, no. 8, Aug. 19, 1920, pp. 356-357, 4 figs. Comparison of two methods determine adoption of central mixing plant and wet batch haulage on concrete road job in Illinois.

Machinery. Large Paving Mixer Puts in 180-

Yard Slab Every Hour. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 658-659, 5 figs. Bulk cement is clamshelled from gondola cars to bins; boxes carrying proportioned batches are crane-charged into mixer.

Recent Developments in Concrete Highway Construction, A. N. Johnson. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 644-647, 5 figs. Special machinery for finishing concrete roads. Paper read before Am. Soc. for Mun. Improvements.

New York Practice. State Highway Construction in New York, Jas. H. Sturdevant. Public Works, vol. 48, no. 10, Mar. 20, 1920, pp. 207-209. Standard practice for concrete roads.

Utilizing Old Macadam to Increase Width of Concrete Road. Eng. News-Rec., vol. 84, no. 10, Mar. 4, 1920, pp. 461-463, 3 figs. Reconstruction of old macadam roads by building concrete surface in two strips with old surface left in middle. Work done by New York State Highway Department.

Proportioning Aggregates. New Ideas Applied to Cement Concrete Roads, W. P. Near. Contract Rec., vol. 34, no. 25, June 23, 1920, pp. 605-608. Abrams' table of proportions and quantities for one cubic yard of concrete, based on laboratory investigations. Suggestions in regard to specification for consistency. Paper read before Canadian Good Roads Congress.

Reinforced. A Reinforced Concrete Highway in Essex. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 708-710, 1 fig. Road is reinforced with fabric which is pressed 1½ inch from bottom.

Reinforcement for. Should "Binding Steel" Be Used in Concrete Highways? W. C. Conger. Concrete, vol. 16, no. 2, Feb. 1920, pp. 77-79. It is claimed the binding steel "will increase the direct tensile property of the concrete," and "will positively prevent the many hair cracks which form in the slab."

Road Plant. The Layout and Operation of a Road Plant at Charles City, Thure W. Ingemanson. Concrete, vol. 17, no. 2, Aug. 1920, pp. 49-52, 15 figs. Organization of material handling and mixing crews for construction of concrete road in Federal Aid project No. 41, in Floyd County, Iowa.

Specifications. Charted Summary of State Concrete Road Specifications, A. N. Johnson. Cement and Eng. News, vol. 32, no. 1, Jan. 1920, pp. 32-33. Chart covers main requirements of various State Highway Departments in regard to fine and coarse aggregate, mixing, consistency, forms, expansion joints, reinforcement, finishing and curing.

New Features in Indiana's Concrete Road Specifications. Eng. News-Rec., vol. 83, no. 13, Sept. 25, 1919, pp. 614-615. Specifications of Ind. State Highway Commission include both one- and two-course construction, with and without reinforcement, but conditions determining use of these alternative designs are not stated.

Subgrade. Concrete Road Construction, H. E. Davis. Contract Rec., vol. 34, no. 10, Mar. 10, 1920, pp. 222-224. Desirability of conducting extensive preliminary investigation before deciding on type of subgrade is emphasized, by reason specially of nature of concrete road which unlike others is made of large monolithic slabs.

Surface Cracks. Concealed Joints in Road Slab Limit Surface Cracks, Samuel H. Lea. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, p. 305. Extra durable roads said to be secured by wood floating as sifted layer of cement and sand into green concrete.

ROADS, EARTH

Maintenance. How to Improve and Maintain Earth, Clay and Sand Roads, A. R. Hirst. Can. Engr., vol. 38, no. 24, June 10, 1920, pp. 553-556. Experience of writer as highway engineer of state of Wisconsin.

Iowa Methods of Widening and Maintaining Earth Roads, A. F. Fischer. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 269-270, 1 fig. Operations planned to build up permanent foundation for paved road. Bulk of work performed by tractor-hauled graders and drags.

Nebraska. Earth Road Work in a Nebraska County. Good Roads, vol. 18, no. 16, Oct. 15, 1919, pp. 181-182. It is said that Hall County's experience in carrying out contract for a 32-mile job has demonstrated that earth roads can be built for 30 cents per cu. yd. and that counties can succeed in contracting to do their own state and federal aid work.

ROADS, GRAVEL

Asphaltic Oils for. Asphaltic Oils for Sand or Gravel Roads, William D. Sohier. Contract Rec., vol. 34, no. 25, June 23, 1920, pp. 616-619. Experiences in Massachusetts.

New Hampshire. The Construction of Crushed Gravel Roads in New Hampshire, Frederic E. Everett. Municipal and County Eng., vol. 59, no. 1, July 1920, pp. 5-6. It requires approximately 145 cu. yd. of covering per mile of 16-ft. road to make two applications. There are about 100 miles of crushed gravel road in N. H., some sections of which have been laid as long as 15 yr.

ROADS, MACADAM

Bituminous. Asphalt Macadam (Bituminous) Roads, and Their Extended Use, H. T. Wakelam. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 737-738. Experiments to determine wearing qualities of various road metals.

Bituminous Surfaced. Bituminous Surface Treated Macadam and Gravel Roads, J. F. Witt. Public Roads, vol. 3, no. 25, May 1920, pp. 3-6, 2 figs. It is claimed that water-bound macadam has been a failure in United States. Practice of writer of treating water-bound macadam with bituminous material is described.

Construction. Method of Constructing Macadam in Province of Quebec, A. Paradis. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 648-649. Method necessitated by reason of special conditions found, such as heavy winter frosts which penetrate several feet into earth and cause heaving, and nature of local materials. Paper read before Can. Good Roads Assn.

Maintenance. Methods of Maintaining Water Bound Macadam at Hartford, Conn. Eng. & Contracting, vol. 53, no. 14, April 7, 1920, pp. 404-406. Attention is directed specially to dust prevention methods and costs.

The Maintenance of Macadam Roads, L. G. Quigley. Municipal & County Eng., vol. 58, no. 5, May 1920, pp. 207-208. Three primary methods of maintaining existing roads are said to be (1) by scarifying and reshaping with possible addition of new stone and rebinding with water and rolling, (2) by patching, and (3) by surface treating with hot or cold bitumens. Each of these methods is discussed. Address at University of Illinois Road School.

Resurfacing. Resurfacing of Old Macadam Streets in Milwaukee, C. J. Van Etta. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 195-196, 4 figs. Surface of old road after being cleaned, is spiked or scarified. Road surface is reshaped, made smooth conforming with grade, but 2½ in. below finished grade, and rolled until firm and hard.

Surface Treatments. Asphaltic Concrete on Old Macadam, W. R. Macatee. Good Roads, vol. 19, no. 15, Apr. 14, 1920, pp. 193-194, 2 figs. Examples of successful use of asphaltic concrete wearing surfaces laid on old macadam roadways as foundations are quoted and construction methods followed are indicated.

Surface Treatments on Macadam Roads, Philip P. Sharples. Contract Rec., vol. 34, no. 15, Apr. 14, 1920, pp. 351-353. Describes system which has been worked out in Maine and New Hampshire using cold refined tars that enable these roads to carry 2000 to 3000 automobiles per day through summer season.

Thin-Coated Macadam. Light Bituminous Treatment for Macadam Roads, Chester A. Hogentogler. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 44-46, 1 fig. Thin coatings are recommended in preference to building up heavy mats.

Water-Bound. Kentucky Practice in Construction of Water Bound Macadam, M. D. Ross. Eng. & Contracting, vol. 52, no. 19, Nov. 5, 1919, pp. 543-545. Paper presented at 1919 Road School at University of Kentucky.

ROADS, TARRED

Tar-Spraying Equipment. Various Technical Considerations and Hygienic Aspects of Modern Methods of Pressure-Spraying Streets with Tar and Sprinkling them with Oil Solution, etc. (Verschiedene technische Vorkehrungen und hygienische Gesichtspunkte bei neuerem Druck-Spritzverfahren mit Teer and Sprengverfahren mit Oellösung für Strassen usw.), H. Kropf. Gesundheits-Ingenieur, vol. 42, no. 52, Dec. 27, 1919, pp. 529-530. Describes a tar-spraying equipment and method of applying Westrumite, an oil-water mixture.

ROCK

Deval Abrasion Test. The Standard Deval Abrasion Test for Rock, F. H. Jackson. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 14 pp., 6 figs. Results of tests made in laboratory of Bur. of Public Roads in connection with proposed changes in Deval abrasion test for rock. It is concluded that results of standard Deval abrasion test as conducted in usual way are accurate to within one per cent.

ROCK CRUSHERS

See CRUSHERS.

ROCK CRUSHING

Plants. Design of Large Rock-Crushing Plants, Brownell McGraw. Rock Products, vol. 22, no. 23, Nov. 8, 1919, pp. 24-25. Location of rejection crushers and storage bins.

Progress Since 1910. Progress in the Fine Crushing of Hard Material (Neuerungen der Hartzerkleinerung), Carl Naske. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 26, June 26, 1920, pp. 469-475, 30 figs. Account of developments during last ten years, with description of simple toggle lever, pendulum roll and gyratory crushers; crushing and grinding in one machine and one operation; machines with separate screening of material to be ground, improvements of Griffin mills; screenless ball mills; combination of ball and tube mills, etc.

ROCK DRILLS

Drill Steel. Handling and Treatment of Rock-Drill Steel at Copper Range Mines, H. T. Mercer and A. C. Paulson. Min. & Metallurgy, no. 164, Aug. 1920, pp. 20-21, 1 fig. Reports of each drill machine are made daily by shop and mine, and tables compiled from these reports show footage drilled, steel broken, drills received and sent out of shop, drills sharpened and bits cut off. Dimensions of drill adopted are given and reasons for their adoption explained. (Abstract.)

Hammer, Hose Fittings for. Standardization of Hose Fittings for Hammer Rock Drills, George H. Gilman. Eng. & Min. Jl., vol. 109, no. 23, June 5, 1920, pp. 1252-1255, 18 figs. Conical joint, standard pipe threads, and use of heat-treated steel are suggested.

Jackhammer. Jackhammer Type Drills in Witwatersrand Mines, E. M. Weston. Eng. & Min. Jl., vol. 109, no. 6, Feb. 7, 1920, pp. 395-397, 4 figs. Shortage of labor is said to have occasioned more general adoption of jackhammers and small piston drills to stoping problems. Suggestions are made in regard to increasing efficiency, notably that operators and supervisors be given systematic instruction in their work.

ROCK EXCAVATION

See EXCAVATION, ROCK.

ROCKETS

Attaining Extreme Altitudes with. A Method of Reaching Extreme Altitudes, Robert H. Goddard. Smithsonian Miscellaneous Collection, vol. 71, no. 2, 1919, 69 pp., 33 figs., partly on 10 supp. plates. Technical determination of minimum initial mass of ideal rocket necessary in order that on continuous loss of mass final mass of one pound will remain at any desired altitude. Also account of experiments performed to devise method of increasing average velocity of ejection of gases. It is said that by firing charges of dense smokeless powder in strong steel chambers provided with smooth tapered nozzles, ejection velocities in excess of 8000 ft. per sec. were obtained.

RODS

Weight of. See CHARTS, Weights of Rods and Tubes.

ROENTGEN RAYS

Spectra. See SPECTRA, Röntgen Field.

ROLLER BEARINGS

See BEARINGS, ROLLER.

ROLLER CHAIN

Standardization of. The Standardization of Roller Chains. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, p. 33, 1 fig. Standard adopted by Assn. of British Chain Manufacturers.

ROLLERS

Road. See ROAD ROLLERS.

ROLLING MILLS

Alloy-Steel Sheets. Carbon Steel Company Jobbing Mill, J. F. Burt. Blast Furnace & Steel Plant, vol. 3, no. 10, Oct. 1920, pp. 545-547, 5 figs. New mill used for rolling high-carbon and alloy-steel sheets and plates at Pittsburgh plant of Carbon Steel Co.

Aluminum Sheet. Aluminum Rolling-Mill Practice, Robt. J. Anderson and Marshall B. Anderson. Chem. & Metallurgical Eng., vol. 22, nos. 14 and 15, Apr. 7 and 14, 1920, pp. 647-650 and 697-702, 3 figs. Apr. 7: Design of rolling mills and plant layout, together with detailed account of all hot and cold slabbing operations before delivery of metal to finishing department. Apr. 14: Production of thin sheets to exact gage, hardness and required surface finish is described in detail, together with associated shearing, annealing, inspecting and shipping operations.

British. New Mill of Messrs. Monks, Hall and

Company, Limited. Iron & Coal Trades Rev., vol. 101, no. 2738, Aug. 20, 1920, pp. 230-231, 8 figs. Mill is 14-in. 3-high tandem, bolting rolls being 18 in. in diameter. Driven by Siemens 400-hp. d.-c. compound-wound mill-type motor, arranged to give speed variation between 92 and 125 r.p.m.

Control Equipment. Control of Mill Tables and Screw Downs, Walter C. Kennedy. Assn. Iron & Steel Elec. Engrs., vol. 2, no. 8, Aug. 1920, pp. 19-33 and (discussion), pp. 33-49, 9 figs. Design of control equipment.

Deformation Work in Rolling. The Numerical Determination of the Deformation Work in Rolling, Forging, etc. (Zur rechnerischen Ermittlung der reinen Umformungsarbeit beim Walzen. Schmieden usw.), H. Preussler. Stahl u. Eisen, vol. 40, no. 19, May 13, 1920, pp. 641-649, 7 figs. Derives expression, based on mathematical-mechanical principle for theoretical minimum power required for deformation of a plastic material, which covers every change in form with regard to stretching, expanding and shaping.

Design. Design of Experimental Rolling Mill, W. B. Skinkle. Blast Furnace & Steel Plant, vol. 8, nos. 5, 7, 8 and 9, May, July, Aug. and Sept. 1920, pp. 271-273, 404-407, 454-457 and 516-520, 31 figs. Details of experimental rolling mill which Carnegie Inst. of Technology is planning to install.

Draft and Peak Load Relations. Plate Mill Draft and Peak Load Relation, J. T. Eaton. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 94-96, 3 figs. Discussion of draft and peak load relations as influenced by steel temperature and number of passes.

Electrically Driven. Automatic Control of Reversing Rolling Mill Equipment, E. S. Lammers, Jr. Assn. Iron & Steel Elec. Engrs., vol. 2, no. 5, May 1920, pp. 13-35, 12 figs. Writer points out that it is possible to make the C. P. (constant potential) motor fields sufficiently fast as to make automatic control of deceleration from weak field speeds impossible; with correct time constant of motor fields, automatic deceleration can be entirely accomplished from control of generator fields; most sensitive condition occurs at weak motor fields and therefore a too high motor-speed range should be avoided; the V. P. (variable potential) fields of this installation are sufficiently slow and number of turns per pole insufficient to allow these fields to materially aggravate abnormal conditions.

Blooming and Continuous Mills at Sharon. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 76-82, 14 figs. Operation of 34-in. blooming and 20-in. continuous electrically driven mills.

Columbia Steel Company's New Plant. Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 401-403, 4 figs. Description of electrically driven merchant mills for production of bars and shapes.

Electric Drive for Rolling Mill for Lead Sheets. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 215 and 218, 4 figs. Equipment consists of 90-hp. mill motor, 75-kw. motor generator set with 2-ton flywheel and Ward-Leonard control gear.

Electric Mill Drives, J. D. Wright. Assn. of Iron & Steel Elec. Engrs., Jan. 1920, pp. 15-24, 6 figs. Discussion of electric mill drives with particular reference to some of factors which influence selection of electric equipment for driving main rolls of various types of mills. Information which is necessary for calculating proper size of motor required to roll any given product.

Electric Reversing Mill Considered from the Standpoint of Tonnage, K. A. Pauly. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 541-544, 2 figs. Discussion of influence of control on rolling time, particularly to effect of limiting maximum power delivered to direct current motor driving rolls. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

Electrical Rolling Mills at Temple-borough. Engineer, vol. 128, no. 3337, Dec. 12, 1919, pp. 586-588, 9 figs., partly on two supp. plates. Designed for reducing 3-ton ingots of 20-in. by 20-in. section principally into blooms 6 in. by 6 in., which will then pass to 21-in. and subsequently to an 18-in. Morgan continuous mill.

Electrical Equipment for 60-inch Universal Plate Mill, R. B. Gerhardt. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 363-366, 9 figs. Description of 60-inch universal plate mill at Sparrow's Point plant of Bethlehem Steel Co., which has been in successful operation for ten weeks.

Electrically Driven Reversing Rolling Mills, Wilfred Sykes. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 545-548, 1 fig. Also in Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1332-1333. Brief review of factors leading up to development and use of reversing rolling mills. Paper read before Am. Iron & Steel Inst.

Electrically Operated Wire Rod Rolling Mill. Engr., vol. 130, no. 3376, Sept. 10, 1920, pp. 250-252, 4 figs. Mill is of semi-continuous type and was originally designed to reduce steel billet of 2 in. square section down to No. 6 S.W.G. in sixteen passes. Generating plant consists of one high-pressure horizontal type Curtiss turbine, running at 300 r.p.m., direct coupled to 1500-kw., 80 per cent power factor, 1875 kva., three-phase, 50-cycle, 2000-volt alternator.

Facts Concerning Auxiliary Drives, Gordon Fox. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 549-550. Factors influencing selection and application of motors and control. Relations of motor to machine and work to be accomplished. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 52, nos. 1, 3 and 5, July 6, 20 and Aug. 3, 1920, pp. 9-12, 90-93 and 171-176, 28 figs. Several types of shears are illustrated; plate and job mills, structural, sheet and tin-plate mills, also wire-rod mills are briefly described. Experience with induction motors driving plate mill. Direct-current reversible motors of 5000 to 15,000-hp. capacity used to run reversing blooming mills.

Shape Mill Rolls Rim Sections, John D. Knox. Iron Trade Rev., vol. 66, no. 5, Jan. 29, 1920, pp. 341-346, 8 figs. Description of new 18-in. unit of Canton Sheet Steel Co., which supplies parent company with steel for demountable rims. Mill and auxiliary equipment are driven electrically.

The Application of Adjustable Speed Main Drives in the Steel Mill, Gordon Fox and Arthur J. Whitcomb. Elec. Jl., vol. 17, no. 9, Sept. 1920, pp. 367-371, 11 figs. Data pertaining to installation of two rotary converter sets of constant horsepower type as installed on 10-inch continuous skelp mill built by Morgan Construction Co. and installed at Mark Plant of Steel & Tube Co. of America at Indiana Harbor, Indiana.

The Krämer Three-Phase Regulating System for Electrically-Driven Rolling Mills and Mine Ventilators (Der Krämer-Drehstrom-Regelsatz in besonderer Ausführung für den Antrieb von Walzenstrassen und von Grubenventilatoren), E. Scherer. Elektrotechnik u. Maschinenbau, vol. 36, no. 12, Mar. 21, 1920, pp. 129-133

and (discussion) pp. 133-134, 8 figs. Paper read before Electrotechnical Soc. of Vienna.

The Largest Rolling Mill in the World. Elecn., vol. 84, no. 2190, May 7, 1920, pp. 519-521, 5 figs. Description and illustrations of a 20,500 hp. electrically-driven British 42-in. plate mill of reversing type, turning out plates at rate of 60 tons per hr. for two hrs. and at rate of 30 tons per hr. for remainder of shift.

See also ELECTRIC DRIVE, Rolling Mills.

Experimental. See Design.

Flywheels for. Motor-Flywheel Drive for Merchant Mill, J. B. Varela. Am. Mach., vol. 53, no. 15, Oct. 7, 1920, pp. 660-663, 2 figs. Method of designing flywheels for rolling mills.

Friction and Spreading Forces. Friction and Spreading Forces in Rolling Mills, W. B. Skinkle. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 11-13, 5 figs. Also in Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 258-259, 7 figs. and Can. Machy., vol. 23, no. 23, June 3, 1920, pp. 528-530, 5 figs. Description of apparatus designed for special series of investigations to be made on experimental rolling mill at Carnegie Inst. of Technology.

Hoop-Iron Rolling. The Rolling of Hoop Iron (Ueber Bandeisenwalzung), Anton Schöpf. Stahl u. Eisen, vol. 40, no. 19, May 13, 1920, pp. 649-651, 4 figs. Recommends for obtaining improvement in hoop-iron rolling for the last passes continuous rolling with small-diameter rolls and low pressures.

Hot Rolling, Theories. The Theory of Hot Rolling and the Determination of Work Required (Zur Kenntnis des Arbeitsbedarfes und der Theorie des Warmwalzens), Frithiof F. von Holmgren. Stahl u. Eisen, vol. 40, no. 6, Feb. 5, 1920, pp. 181-188, 6 figs. Determination of work required in rolling by means of a tachograph with constant paper speed. Analysis of Puppe tests and confirmation of certain laws according to which work varies with temperature.

Motor Equipment. Adjustable-Speed Motor Equipment for Rolling Mills, Fraser Jeffery. Power, vol. 51, no. 11, Mar. 16, 1920, pp. 408-412, 9 figs. Use of a combination of induction motor rotary converter and direct-current machine with control equipment known as Kraemer system, is said to make it possible to obtain speeds independent of load and economical operation at these speeds whether near synchronism or much lower.

Plate Mills. A New Universal Plate Mill. Iron Age, vol. 106, no. 5, July 29, 1920, p. 265, 1 fig. Mill is said to be capable of rolling plates from minimum width of 6 in. to maximum of 40 in.

Electrical Equipment of the Largest Plate Mill in the World, G. R. Strate. Jl. Engrs.' Club of Philadelphia, vol. 37-7, no. 187, July 1920, pp. 265-272, 11 figs. Details of Lukens Steel Co. plate mill, Coatesville, Pa., in which total of 3776½ hp. is installed. There are 29 compound and shunt motors of 539½ hp., and 3227 hp. in 76 series motors; in entire plant there are 84 overhead traveling cranes, 5 charging machines and 3 mono-rail cranes with total lifting capacity of 1690 tons; there are installed total of 710 d.c. motors with rated capacity of 16,000 hp.

First Plate Mill Built in Canada. Iron Age, vol. 106, no. 5, July 29, 1920, pp. 259-262, 5 figs. Plant built by Dominion Iron & Steel Co. at cost of $5,000,000. Mill is of Lauth type, consists of one stand of rolls served by tilting tables, and is driven by 4000-hp. motor through set of cut herringbone pinions.

Power Drives. Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 51, no. 8, Feb. 24, 1920, pp. 291-296, 5 figs. Description of new boiler plant at Republic Iron & Steel Co.'s works, of which the ash- and coal-handling equipment is said to be of especial interest. Stokers are motor-driven and forced- and induced-draft fans are turbine-driven through a reduction gear.

Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 51, nos. 20 and 24, May 18 and June 15, 1920, pp. 800-803 and 962-966, 11 figs. May 18: Various types of engine valves are treated as applying to rolling mill units. Reference is made to two large poppet-valve uniflow engines operating a 9- and 12-in. merchant mill. Engines operate with condensers and have disk-driven governors so designed that engine speed can be regulated while engine is in operation. June 15: Several types of mills are described, together with details regarding process in rolling steel into various products, from ingot into slabs, billets, skelp, plates and pipes.

Power Piping in. Power Piping Requirements in Modern Mills, J. Roy Tanner and George J. Stuart. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 566-568. It is claimed that development of power generating machinery has stimulated progress in manufacture and mode of installation of power piping and placed heavier demands on specialists. Paper read before Engrs. Soc. of Western Pa.

Pulverized Coal for. Burning Powdered Coal in a Rolling Mill, H. T. Matthew. Combustion, vol. 2, no. 4, Apr. 1920, pp. 12-16 and 32-34, 9 figs. Description of plant of the Newport Rolling Mill Co., Ky., in which pulverized coal has superseded all former methods of furnace firing including hand-firing, stoker-firing and natural gas firing. Coal is said to be prepared by a standardized process of crushing, drying, pulverizing, etc.

Rail Rolling. Pipeless Rolled Products from Annular Blooms, C. A. Witter. Iron Age, vol. 105, no. 23, June 3, 1920, pp. 1593-1595, 3 figs. Also in Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 414-416, 4 figs. Proposed method of rolling rails, blooms, billets, and bars that will be free from piping and segregation. Solution of railroad's and rail manufacturer's problems. Paper before Am. Iron & Steel Inst.

Research. The Bureau of Rolling-Mill Research, W. B. Skinkle. Proc. Engrs. Soc. Western Pa., vol. 36, no. 5, June 1920, pp. 295-328 and (discussion) pp. 329-344, 42 figs. Plans for research mill which is to be built at Carnegie Inst. of Technology by organization of steel and equipment manufacturers and engineers.

Reversing, Automatic Control. See ELECTRIC DRIVE, Rolling Mills.

Roll Design. The Proportions of Beam and Channel Roll Trains (Bemessung von Trägerstrassen), C. Holzweiler. Stahl u. Eisen, vol. 40, no. 37, Sept. 16, 1920, pp. 1225-1227 and (discussion) pp. 1227-1228, 3 figs. Writer seeks to demonstrate that with rolls as short as possible, and therefore thin, the most favorable results can be obtained. Report from Rolling Mill Committee of Assn. German Foundrymen.

Rolling, Strains in. See METALS, Rolling, Strains in.

Sack Universal Mill. Wide Flange Beams by the Sack Method. Iron Age, vol. 106, no. 9, Aug. 26, 1920, pp. 519-521, 10 figs. Construction of special universal mill for process. Details of various stands and rolls.

Sheet Mills. Bethlehem's Sheet and Tin Plate Mills. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1433-1435, 1 fig. Description of arrangement and equipment of sheet mills, together with account of enlarged tin plate department of Maryland plant.

Falcon Steel Company Operates Sheet Mill. Modern Plant Uses Powdered Coal Fuel. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 274-280, 12 figs. Sheet mills of Falcon Steel Co., of Niles, Ohio. Features to which attention is directed are extra heavy mills, electric drive, pulverized-coal fuel, continuous pair furnaces, electric charging, water-cooled floors, and steam blast for regulating temperature of hot rolls.

Wider Sheet Bars Advocated, Clement F. Poppleton. Iron Age, vol. 105, no. 20, May 13, 1920, pp. 1359-1363, 4 figs. Matter of balanced rigging in stands. Economies calculated and two layouts shown by way of illustrations.

See also Alloy-Steel Sheets.

Ship-Plate. The Dominion Iron and Steel Company's New Ship-Plate Rolling Mill, H. E. Rice. Can. Min. Inst. Bul. no. 97, May 1920, pp. 367-377, 5 figs. Also in Iron & Steel of Canada, vol. 3, no. 4, May 1920, pp. 116-119, 3 figs. Mill is a 110-in. x 36-in. three-high plate mill of Lauth type. It consists of one stand of rolls served by tilting tables and is driven by 4000-hp. 82-r.p.m. motor through set of cut herringbone pinions.

Spreading Forces in. See Friction and Spreading Forces.

Strip Rolling. Rolls Strip Steel in Long Lengths, G. H. Manlove. Iron Trade Rev., vol. 65, no. 20, Nov. 13, 1919, pp. 1317-1320, 6 figs. Vertical guides near last finishing stand impart oscillating motion to product as it slides on edge to coilers.

Theory of. The Present Status of the Theory of the Rolling-Mill, W. Trinks. Proc. Engrs. Soc. Western Pa., vol. 36, no. 5, June 1920, pp. 275-294, 20 figs. Elements available for developing complete theory dealing with (1) forces between stock and rolls, (2) deformation of stock, and (3) effect of forces upon mill.

Water-Cooled Floors. Design and Use of Water Cooled Floors, W. H. Melaney. Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 399-400. Discussion showing general construction and design of these floors as well as their intrinsic value to sheet and tin mills from both labor and production standpoint.

ROOF TRUSSES

Reinforced-Concrete. See CONCRETE CONSTRUCTION, REINFORCED, Roof Trusses; PIERS, Concrete Roof Trusses.

ROOFING MATERIALS

Paper. List of International Patents for the Production of Roofing Paper and Roofing Paper Paints (Herstellung von Dachpappe und Dachpappeanstrichen nach der Patentliteratur in tabellarischer Uebersicht), H. Marschalk. Kunststoffe, vol. 10, no. 3, Feb. 1, 1920, pp. 27-30.

ROOFING TILE

Concrete. Concrete Roof Tile and Cement Asbestos Shingles. Contract Rec., vol. 34, no. 16, Apr. 21, 1920, pp. 368-370, 3 figs. Account of reports to Nat. Conference on Concrete House Construction by Committee on Concrete Roofing Tile and Cement Asbestos Shingles, calling attention to great need for wider use of fire-resisting roof coverings, to which is appended individual reports on structural qualifications and peculiar merits of different types and colors of concrete roofing tile and cement asbestos shingles.

ROOFS

Paper-Mill, Decay Prevention. Paper Mill Roofs, R. J. Blair. Paper, vol. 25, no. 17, Dec. 31, 1919, pp. 15-23, 12 figs. Investigations of Forest Products Laboratories of Canada to determine best method of preventing decay in timber of pulp and paper mill roofs.

Reinforced-Concrete. Concrete Arched Beams and Open Girder Carry Roof of Theater. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 27-28, 4 figs. Reinforced-concrete roof and balcony designed on Hennebique system.

Sawtooth. Wide-Span Sawtooth Roofs [Weitspannende Sägeformdächer (Fachwerk-Sheds)], Em. Haimovici. Eisenbau, vol. 11, no. 7, Apr. 9, 1920, pp. 141-143, 6 figs. Describes construction method, effecting a great saving in steel.

ROPE

Bast Fiber. The Mechanical Properties of Philippine Bast-Fiber Ropes, Albert E. W. King. Philippine Jl. Sci., vol. 14, no. 6, June 1919, pp. 561-655, 7 figs. on five supp. plates. Results of experiments.

Wire. See WIRE ROPE.

ROPE DRIVE

Cotton Rope. Cotton Rope for Power Transmission, J. Melville Alison. Jl. Eng. Inst. of Canada, vol. 3, no. 6, June 1920, pp. 292-298, 10 figs. Discussing comparative advantages of cotton and manila rope it is claimed that although cotton is dearer than manila, "its superior resilience grip and groove impact add so greatly to driving force that up to one-third more horsepower may be transmitted." It is stated that cotton has entirely supplanted any other material for transmission work in England. Table of horsepowers transmitted by three-strand cotton driving rope of various diameters is included.

Multiple-Pulley. Single-Rope Multiple-Pulley Drive (Ueber Mehrscheibenantriebe mit Umschlingung durch dasselbe Seil), Otto Ohnesorge. Fördertechnik u. Frachtverkehr, vol. 13, nos. 5 and 6, Mar. 5 and 19, 1920, pp. 52-54 and 62-65, 7 figs. Points to differences between single-pulley drive and rigid two-pulley drive, and explains peculiarities of two-pulley drive with tension equalization, especially in regard to wear and tear, efficiency and the mechanical law involved.

ROPES

Knots and Hitches in. Knots and Hitches. Contracting, vol. 9, no. 9, Jan. 1, 1920, pp. 247-248, 15 figs. Examples of manila rope fastenings said to be most useful for erection and construction purposes.

ROPEWAYS

See CABLEWAYS.

ROUNDHOUSES

See ENGINEHOUSES.

ROUTING

Work. See COST ACCOUNTING, System.

RUBBER

American Cactus Gum. Experiments with a New Cactus Rubber, Emmet S. Long. India Rubber World, vol. 62, no. 5, Aug. 1, 1920, pp. 709-710, 1 fig. Developments in rubber industry in America predicted as a result of experiments with gum extracted from American cactus.

Artificial. See Synthetic.

Bibliography. Review of Works on Rubber and Gutta-Percha During 1916-1918 (Arbeiten über Kautschuk und Guttapercha. Bericht 1916-1918), C. H. Hillen. Zeitschrift für Ange-

wandte Chemie, vol. 32, nos. 76 and 78, Sept. 23 and 30, 1919, pp. 301-304 and 309-312. References to works on vulcanization and regeneration. Studies and patents for the manufacture of rubber and gutta percha goods; works on the scientific analysis of rubber.

Cold Vulcanization. The Cold Vulcanisation of Rubber. Chem. Age (Lond.), vol. 3, no. 55, July 3, 1920, pp. 4-5. Account of new Peachey process with appendix giving opinions of H. P. Stevens and Frederick Kaye. Outstanding advantages are said to be: Elimination of cost of steam through cold vulcanization; process occupies about one quarter of time needed by Goodyear process; agents employed—sulphur dioxide and hydrogen sulphide—are available in almost unlimited quantities and at very low cost; dipped goods can be rapidly and effectively cured by new process, etc.

Expansion During Vulcanization. The Expansion of Rubber Compounds During Vulcanization, C. W. Sanderson. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 37-40, 5 figs. Experiments to determine whether or not use could be made of expansion test in distinguishing between stocks which move freely and mold well and those which do not mold well.

Extraction. Extraction of Rubber Goods, S. W. Epstein and B. L. Gonyo. Technologic Papers, Bur. of Standards, no. 162, April 9, 1920, 13 pp. Extraction for 8 hr. with acetone followed by 4 hr. extraction with chloroform did not remove all soluble material from some rubber compounds. Constant boiling mixture of 68 per cent chloroform and 32 per cent acetone exhibited marked ability to dissolve vulcanized rubber. It is recommended that constant boiling mixture 55 per cent carbon bisulphide and 45 per cent acetone be used in place of acetone and chloroform to extract rubber samples.

Hot-Process Vulcanization. The Hot Vulcanization of Rubber (Zur Frage der Heissvulkanisation des Kautschuks), F. Kirchhof. Kolloid-Zeitschrift, vol. 26, no. 4, Apr. 1920, pp. 168-173. Discussion of C. Harries works in which vulcanization is interpreted as a physical-chemical phenomenon, to which interpretation author claims to have arrived at an earlier date. Describes experiments showing that other materials besides sulphur can exert a vulcanizing influence.

Mechanical Goods. War Department Specifications for Mechanical Rubber Goods. India Rubber World, vol. 62, no. 6, Sept. 1, 1920, pp. 805-808. Belting, corrugated hose, dredging sleeves, packing and valves.

Permeability to Gases. Permeability of Rubber to Gases, Junius David Edwards and S. F. Pickering. Dept. Commerce, Sci. Papers of Bur. of Standards, no. 387, July 12, 1920, pp. 327-363, 9 figs. Also in Chem. & Met. Eng., vol. 23, nos. 1 and 2, July 7 and 14, 1920, pp. 17-21 and 71-75, 7 figs. Certain of factors which determine permeability of rubber to gases were investigated and relative rates of penetration of number of gases determined. It was found, for example, that permeability to hydrogen is inversely proportional to thickness of rubber and that permeability to any gas is found to be directly proportional to its partial pressure, provided total pressure is constant.

Research. Future Rubber Research, Andrew H. King. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 449-450. Appeal for more and improved methods of testing rubber and its products as guide to compounding. Need for study of fabric and design of products. Continuous vulcanizing and temperature control essential.

Solvents. Tetralin (Ueber Tetralin), H. Utz. Gummi-Zeitung, vol. 34, no. 37, June 11, 1920, p. 779. Describes new product originally intended as substitute for oil of turpentine and produced by the hydration of naphthaline according to process by Prof. Schroeter. Results of investigations show it to be a good solvent for rubber.

Stress-Strain Curve. Some Aspects of the Rubber Stress-Strain Curve, William B. Wiegand. Can. Chem. Jl., vol. 4, no. 6, June 1920, pp. 160-170, 21 figs. Survey of researches made by various investigators.

The "Slope" or "Type" of the Rubber Stress-Strain Curve, O. de Vries. Jl. Soc. Chem. Ind., vol. 39, no. 18, Sept. 30, 1920, pp. 308T-310T. States that mathematical solution of stress-strain curves as conchoidal curves, evolved by Schidrowitz and his co-workers, does not strictly hold good for author's method of testing, and their conclusions as to "correct" curve are not generally applicable.

Synthetic. An Examination of German Synthetic Rubber, Lothar E. Weber. India Rubber World, vol. 61, no. 2, Nov. 1, 1919, pp. 71-72, 4 figs. Results of chemical analyses of four samples of synthetic rubber obtained from Germany and tests for determining their aging properties cause writer to call this synthetic product an astounding chemical accomplishment.

The Employment of Old and Artificial Rubber for the Manufacture of Automobile Tires During the War (Die Verwertung von Altgummi und künstlichem Kautschuk während des Krieges), H. Memmler. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 7, Sept. 1919, pp. 83-89. Brief survey of what is described as phenomenal work accomplished by the German Army Administration and rubber industry during war, although it is admitted that in spite of these efforts, the final result aimed at has not been achieved. Writer believes no definite statement can yet be made as to future development of synthetic rubber.

Technology. Proceedings of Rubber Division, A. C. S., Chicago Meeting, 1920. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 738-742. Committee reports comprising aging of some rubber compounds, microscopic study of vulcanized rubber containing fillers, organic accelerators, polysulphide theory of accelerator action, effect of heat and light on vulcanized rubber.

Volume Increase Under Strain. Volume Increase of Compounded Rubber Under Strain, H. F. Schippel. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 33-37, 11 figs. Account of tests. It is concluded that "the greater the mean diameter of the pigment particles, the greater is the volume increase under strain."

Vulcanization. A New Process for the Vulcanisation of Rubber, S. J. Peachey. Rubber Age, no. 5, July 1920, pp. 196-197. New process consists in exposing rubber successively to action of sulphur dioxide and hydrogen sulphide. It is said to be applicable to rubber in dissolved form as well as in ordinary form, and to have many other advantages.

The Acceleration of Vulcanization, D. F. Twiss and S. A. Brazier. Jl. Soc. Chem. Indus., vol. 39, no. 9, May 15, 1920, pp. 125T-132T, 10 figs. Experimental study of three methods: (1) raising temperature, (2) increasing proportion of sulphur relative to rubber, and (3) introducing accelerator.

The Determination of True Free Sulfur and the True Coefficient of Vulcanization in Vulcanized Rubber, W. J. Kelly. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 875-878. Two methods for rubber analysis are presented. First is said to give correct value

for free or elementary sulphur in rubber goods, and second lower and more accurate value for coefficient of vulcanization than can be obtained by any of older methods.

The Expansion of Rubber Compounds during Vulcanization, C. W. Sanderson. India Rubber World, vol. 61, no. 5, Feb. 1, 1920, pp. 292-294, 5 figs. It is determined that the coefficient of cubical expansion increases with the rubber content and decreases as degree of hardness of crude rubber increases.

Vulcanized, Preservation of. The Preservation of Vulcanized Rubber, Henry P. Stevens. Jl. Soc. Chem. Industry, vol. 39, no. 14, July 31, 1920, pp. 251T-253T. Experimental. It is said that life of vulcanized rubber is prolonged by storing in air saturated with moisture or petroleum vapor. It is claimed that even overcured rubber can be preserved by this means for 6 or 7 months at tropical temperatures.

RUBBER GOODS

Cellulose in. Determination of Cellulose in Rubber Goods, S. W. Epstein and R. L. Moore. Tech. Papers Bur. Standards, no. 154, Feb. 20, 1920, 16 pp. Method is outlined for determination of fabric in rubber sheeting, raincoat materials, waterproofed fabrics, spread goods, and frictioned and calendered fabrics in general. Presence of leather in mixings is shown not to interfere with determination of cellulose.

Specifications. War Department Specifications for Mechanical Rubber Goods. India Rubber World, vol. 62, no. 4, July 1, 1920, pp. 649-651. Specifications for cotton rubber-lined fire hose, gasoline hose, pneumatic hose, suction hose, and water hose.

RUBBER INDUSTRY

Machinery for. New Machinery in the Rubber Industry (Neue Maschinen für die Kautschuk-Industrie). Gummi-Zeitung, vol. 34, nos. 16 and 17, Jan. 16 and 23, 1920, pp. 325-327 and 350-352, 10 figs. Description of various apparatus manufactured by Werner & Pfleiderer, Cannstatt-Stuttgart, including automatic rubber kneading machine and washing machines; a kneading and mixing machine with tipping trough and double casing for beating and cooling; a hydraulic filter press for the filtration of the finished rubber solution, etc.

Taylor System in. The Taylor System in the Rubber Industry (Taylorisierung in der Kautschukindustrie), Edgar Herbst. Gummi-Zeitung, vol. 34, no. 8, Nov. 21, 1919, pp. 145-147. Writer makes suggestions as to manner and extent in which German rubber industry can make use of methods of scientific industrial management.

RUBBER MILLS

Electric Drive. See ELECTRIC DRIVE, Rubber Mills.

RUDDERS

Kitchen Type. Manoeuvering and Reversing Rudders. Engr., vol. 129, no. 3345, Feb. 6, 1920, p. 149, 10 figs. Also in Shipbuilding & Shipping Rec., vol. 15, no. 7, Feb. 12, 1920, pp. 199-200, 10 figs. Form evolved by J. G. E. Kitchen, of Lancaster, England. Essential parts of rudders consist of two curved deflectors formed as parts of circular cylinder, partly enclosing propeller. Both deflectors are pivoted at top and bottom on common centers, and their opening or closing regulates speed of ship.

RUST

See CORROSION.

RUST PREVENTION

Lime for. Lime as a Rust Preventive—Or Why Hydrate Should be Used in Plaster, Thomas W. Cappon. Rock Products, vol. 22, no. 26, Dec. 20, 1919, pp. 37-39. Gypsum plaster was first mixed with water and powdered iron; after setting hard, metal particles plainly evidenced corrosion. In subsequent experiments lime was added to mixture and plaster showed "hardly any signs of rust."

Phosphatic Coatings for. Phosphatic Coating for Rust Proofing Iron and Steel, L. E. Eckelmann. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 787-789, 4 figs. After exposing various methods of phosphatizing writer observes that while phosphatic coatings "are not so resistant to wear and abuse as sherardized or galvanized metals," nevertheless "phosphatic rustproofing is considerably cheaper than any other well known rustproofing process in use today."

[See also HOT-WATER SUPPLY.]

RUSTPROOFING

Electric Process. Electro Sherardizing. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 649-652, 5 figs. Describes application of a rustproof coating to miscellaneous products including sheet metal. Special reference is made to practice of the Wise Electro Sherardizing Co., of Detroit, and the General Electric sherardizing equipment. Limitations of sherardizing process are pointed out.

[See also CORROSION.]

S

SACCHARIMETERS

Commercial. Specification for a Commercial Quartz-Wedge Saccharimeter as Compiled by American Sugar Chemists. Int. Sugar Jl., vol. 21, no. 251, Nov. 1919, pp. 565-568. Based on suggestions received from various individuals and associations representing over 100 chemists.

SACCHAROSE

Diastatic Inversion. Diastatic Inversion of Saccharose; Influence of Products of Reaction on Velocity of Hydrolysis (Sur l'inversion diastasique du saccharose; influence das produits de la réaction sur la vitesse d'hydrolyse), H. Collin and A. Chaudun. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 849-852. Experiments are said to have established that velocity of hydrolysis is function of first degree of fluidity of solutions and retardation of diastatic inversion of saccharose, due to presence of glucose, is attributed to increase of viscosity of solution.

SAFEGUARDS

Location of. The Fundamental Principles of Safeguarding, Sydney J. Williams. Min. & Sci. Press, vol. 119, no. 21, Nov. 22, 1919, pp. 746-748; also Safety Eng., vol. 38, no. 4, Oct. 1919, pp. 217-219. Point in regard to location of safeguards for counterweights, cranks, reciprocating parts, etc. Paper read before National Safety Congress.

Workmen and. Methods of Securing Coöperation of Workmen in Using Safeguards, Holger Jen-

sen. Wood-Worker, vol. 38, no. 9, Nov. 1919, pp. 45-46. Responsibility for obtaining workmen's coöperation is seen to rest mainly with employer in providing of efficient guards.

[See also BENZOL, Poisoning by; CARS, Hand, Accidents; CEMENT MANUFACTURE, Mill Accidents; MINES, Accidents in; Rescue; POISONING; TEXTILE INDUSTRY.]

SAFETY

Codes. See SAFETY CODES.

Departmental Meetings. Safety and Welfare Work in Industrial Plants, H. A. Schultz. Proc. Engrs. Soc. Western Pa., vol. 35, no. 8, Nov. 1919, pp. 395-423 and (discussion) pp. 424-426. Recommends holding departmental safety meetings regularly, conducting safety lectures periodically in training and apprenticeship schools and holding safety rallies occasionally for workmen and their families. Practice of U. S. Steel Corp. is quoted as example.

DuPont Company. The Engineer's Place in Safety Work, L. D. DeBlois. Jl. Cleveland Eng. Soc., vol. 12, nos. 2 and 3, Sept.-Nov. 1919, pp. 135-140 and (discussion) pp. 140-146. Work of safety section of DuPont Company.

Fire Protection and. See FIRE PROTECTION, Safety and.

Industrial. See WELFARE WORK, Medical Attention.

Mines. See MINES, Safety in.

Standards Available. What Constitutes Good Inspection? Lew R. Palmer. Safety Eng., vol. 38, no. 6, Dec. 1919, pp. 323-326. List of available industrial safety standards which have been formulated by representative national organizations, such as Nat. Safety Council, Am. Soc. M. E., and U. S. Shipping Board Emergency Fleet Corp.

Steel Mills. See STEEL MILLS, Safety Movement in.

Textile Mills. See TEXTILE MILLS, Safety in.

[See also SAFETY DEVICES; RAILWAYS, Safety Work.]

SAFETY CODES

Electrical. Proposed Changes in Part II, National Electrical Safety Code. Elec. Rev., Chicago, vol. 75, nos. 23 and 24, Dec. 6 and 13, 1919, pp. 944-948 and 982-986. Text of proposed revision of section 28 and comment on voltage classification prepared by Bur. of Standards.

Ladders. See LADDERS, Safety Code.

SAFETY DEVICES

Machine Safeguards. See PUNCHING MACHINES, Safety Devices for; SAFEGUARDS, Location of.

SAFETY ENGINEERING

Training Supervisors. Twelve Months' Progress in Safety Work, David van Schaack. Safety Eng., vol. 38, no. 4, Oct. 1919, pp. 202-206. Rapid development of work-schools for safety supervisors, safety education, St. Louis plan, and the promotion of national efficiency are discussed. Paper read before Eighth Annual Safety Congress.

SAFETY LAMPS

See MINERS' LAMPS.

SAFETY PINS

Manufacture. The "Helmet" Safety Pins and the Machines for Making Them, S. A. Hand. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 327-329, 11 figs. Machine takes wire from coil, straightens it, cuts it to length, sharpens point, coils it and assembles it to head.

SAFETY STANDARDS

Mines. See MINES, Safety Standards.

SALTS

Precipitation by Refrigeration. Salt Precipitation from Mixed Solutions by Refrigeration. Cold Storage, vol. 23, no. 265, April 15, 1920, p. 93, 2 figs. German apparatus for precipitating salts out of mixed solutions by means of crystallization. This is done by cooling concentrated brines to point where their ability to maintain salts in solution is reduced. Translated from Zeitschrift für die Gesamte Kälte.

SAMARIUM

Production and Properties of. Observations on the Rare Earths. The Purification and Atomic Weight of Samarium, A. W. Owens, C. W. Balke and H. C. Kremers. Jl. Am. Chem. Soc., vol. 42, no. 3, Mar. 1920, pp. 515-522. How samarium was obtained from rare earth residues. Cerium was removed by means of bromine and marble; lanthanum, praseodymium and neodymium were removed by fractionation of rare earth magnesium double nitrates; europium and gadolinium were removed by fractionation of rare earth magnesium double nitrates along with bismuth magnesium double nitrate; final purification was alternate precipitation of samarium material as hydroxide and oxalate and five recrystallizations of this material as hydrated chloride.

SAND

Drying Plant. See OIL FUEL, Storage Plant.

Glass. See GLASS MANUFACTURE, Sand for.

Horizontal Pressure of. Experiments on the Horizontal Pressure of Sand, Ponsonby Moore Crosthwaite. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 253-254. Results of experiments recently made by author to ascertain angle of internal friction in sand, clay and other materials by loading a plunger of known diameter and measuring penetration caused by known weights. Author presents conclusions drawn from his investigations. Abstract of paper read before Instn. C. E.

Molding. See SAND, MOLDING.

Plants. Completely Designed Sand and Gravel Plant. Rock Products, vol. 23, no. 11, May 22, 1920, pp. 21-26, 16 figs. Iowa plant operated with dragline excavator makes separate crushed stone and sand and gravel products.

Operations of Ohio River Sand Co. Cement, Mill & Quarry, vol. 16, no. 9, May 5, 1920, pp. 27-29, 8 figs. Describes what is said to be thoroughly modern method of producing sand and gravel.

Screening and Washing. The Design of Sand and Gravel Screening and Washing Plants, Frank M. Welch. Rock Products, vol. 23, no. 17, Aug. 14, 1920, pp. 21-25, 10 figs. Considerations regarding loading, type of building and kind of power to use. Concluding article of series of six.

SAND BLAST

Applications. Application and Growth of Sand Blasting, H. D. Gates. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 14-16, 5 figs. Types of machines are described and illustrations are presented which show work before and after being sand-blasted.

Rotary Sand-Blast Barrel. New Type Rotary Sandblast Barrel. Brass World, vol. 16, no. 6, June 1920, p. 177, 1 fig. Details of design and operation of a sandblast barrel for cleaning small castings by sand blasting while rotat-

ing them to insure constant change of position, feature of which is said to be elimination of hoppers, manifolds or other projections extending into interior of drum itself, thus providing increased capacity for castings.

SAND, MOLDING

Bond. Judging Sands for Foundry Use, Henry B. Hanley and Herbert R. Simonds. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 772-774. Relation of absorption to bond in sands.

Handling Equipment. Modern Foundry Sand Handling Equipment, H. L. M'Kinnon. Iron Age, vol. 104, no. 25, Dec. 18, 1919, pp. 1257-1259, 7 figs. Illustrates uses of roughing screen, tempering machine, belt conveyors, and individual sand hoppers. Paper read before Am. Foundrymen's Assn.

Non-Ferrous Foundries. Moulding Sands for Non-Ferrous Foundry Work, P. G. H. Boswell. Engineering, vol. 108, nos. 2804 and 2805, Sept. 26 and Oct. 3, 1919, pp. 418-420, 1 fig., and pp. 464-466, 3 figs. Results of chemical and mechanical analyses. Graphical representation of variation of chemical composition with grade of molding sand from Bunter deposits at Compton, near Wolverhampton. Paper read before Inst. Metals.

Standardization. Standardization of Molding Sands, C. Powell Karr. Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 845-849, 2 figs. Suggestions for classifying and establishing relative values. Apparatus and methods for testing. Characteristics of typical sands.

Testing. Laboratory Testing of Sands, Cores, and Core Binders, F. L. Wolf and A. A. Grubb. Min. & Metallurgy, no. 165, Sept. 1920, pp. 20-21. Account of tests developed during past year by Ohio Brass Co. for sands, cores, and binders which bear a close relation to particular use to which these materials are put in foundry and which are said to be fairly indicative of their value. (Abstract.)

SANITATION

Death Rate and. See CITIES.

Fly and Mosquito Elimination. Fly and Mosquito Elimination Work in New York City, Joseph M. Lonergan. Municipal Engrs. Jl., vol. 6, no. 2, 1920, pp. 126.1-126.17 and (discussion) pp. 126.17-126.21, 13 figs. Gives regulations governing maintenance of stables, and other work of the Department of Health. Illustrates life cycle of mosquito.

[See also CITIES, Hygiene and Employment.]

SAWING MACHINES

Vertical. A Rapid Vertical Sawing Machine for Metal. Shipbuilding & Shipping Rec., vol. 14, no. 22, Nov. 27, 1919, pp. 621-622, 3 figs. Blade is set vertically and this with angular setting of frame is said to enable machine to be utilized for large number of jobs.

SAWS

Band, Horizontal Log-Cutting. Horizontal Log-Cutting Band Saw. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 256-257, 9 figs. Description and illustrations of improved tensioning gear applied to horizontal log-cutting band saws, constructed by Thomas Robinson & Son, Ltd., Rochdale, England.

Circular, Power Required. Investigations of Power Consumed in Cutting Wood by Means of Circular Saws with Set Teeth (Untersuchungen über den Nutzarbeitsverbrauch bei der Spanabhebung am Holze durch geschränkte Kreissägen), Karl Wasserberger. Der praktische Maschinen-Konstrukteur, vol. 53, no. 18, May 6, 1920, pp. 65-87, 13 figs. A general equation is worked out and tested, and coefficients for different specimens of soft wood and hard wood are determined from the results of cutting tests according to the method of the smallest square. Influence of the bluntness of teeth on amount of mechanical energy consumed is determined in the case of hard and soft wood. Bibliography.

Hack. See HACK SAWS.

SCAFFOLDS

Safeguards for. Poor Scaffolding a Cause of Many Accidents. Contract Rec., vol. 33, no. 47 and 48, Nov. 19 and 26, 1919, pp. 1069-1072 and 1098-1100, 9 figs. Safety measures in their erection. Concerning proper use of guard rails, foot boards and overhead protection and erection of outrigger and suspended scaffolds.

[See also LADDERS.]

SCALES

Grain-Hopper, Errors in. Errors in Grain Hopper Scale, C. A. Briggs. Scale Jl., vol. 6, no. 8, May 10, 1920, pp. 7-9 and p. 11, 8 figs. Results of tests at Bur. of Standards.

Micro-Balance. Experiments with a new Micro-Balance, Hans Pettersson. Physical Soc. of London, Proc., vol. 32, no. 4, June 15, 1920, pp. 209-221, 5 figs. The technique of the fiber-suspended micro-balance has been much simplified, so that it can now be used by anybody with scientific training. Various balances are described.

Specifications. Scale Manufacturers' Standard Specifications for Grain Hopper Scales. Scale Jl., vol. 6, no. 8, May 10, 1920, pp. 10-11. Specifications adopted by scale manufacturers.

Tolerances for. Tolerances and Test Loads for Master Scales, E. D. Gordon and C. A. Briggs. Scale Jl., vol. 6, no. 7, April 10, 1920, pp. 25-27, 4 figs. From study of results upon master scale tests made during past four years. Bur. of Standards recommends adoption of tolerance system proportional to square root of corresponding test loads, and that a test of 60,000 lb. be used for purpose of adjusting master scales.

Track. A New Track Scale, L. R. Boyer. Scale Jl., vol. 6, no. 10, July 10, 1920, pp. 7-8, 7 figs. Also Ry. Rev., vol. 66, no. 20, May 15, 1920, pp. 799-801, 4 figs. Specifications adopted by various associations involving necessary changes in design to destroy inchangeability of new and old scales. Further changes were made to remove incongruities in design.

A Two Section Railroad Track Scale. Scale Jl., vol. 6, no. 12, Sept. 10, 1920, pp. 7-8, 5 figs. Scale to be installed at Naval Ordnance Plant for weighing armor plate and big guns. Scale is to be constructed with two sections and equipped with Strait Standard four-link parallel acting suspension bearings for weigh bridge. Each section is to have a capacity of 200 tons and scale will be equipped with type registering beam of 300 tons capacity.

Specifications for Railroad Track Scales. Bul. Am. Ry. Eng. Assn., vol. 21, no. 225, March 1920, pp. 5-101, 24 figs. Rules for location, maintenance, operation and testing of scales are suggested. Specifications apply to knife edge scales of straight and torsion lever types for weighing cars in regular interchange service. They were prepared by committee representing Am. Railroad Assn., Am. Ry. Eng. Assn., U. S. Bur. Standards, Railroad & Warehouse Commission of Minnesota, Nat. Scale Men's Assn. & Scale Manufacturers' Assn.

SCANDIUM

Atomic Weight. Scandium (Ueber das Skandium),

R. J. Meyer and B. Schweig. Zeitschrift für anorganische und allgemeine Chemie, vol. 108, no. 4, Oct. 24, 1919, pp. 303-317. Results of tests are said to confirm exact determinations of O. Hönigschmid, according to which atomic weight of scandium from native tungstite does not correspond to the accepted number 44, but is slightly over 45. From the Sci. Chem. Laboratory of Berlin N.

SCHOOL ROOMS

Ventilation. Report on Status of School Ventilation in the United States. Jl. Am. Soc. Heating & Ventilating Engrs., vol. 26, no. 2, Mar. 1920, pp. 183-188. Results of tests comparing mechanical and natural ventilation of school rooms. It was found that it was impossible to keep temperature and air motion conditions in naturally-ventilated rooms within bounds of comfort; that illness of pupils and teachers in naturally-ventilated rooms increased to alarming extent; and that in such rooms air was stagnant and heavy, causing depression and headaches.

SCHOOLS

Apprentice. See APPRENTICES, TRAINING OF, Schools.

Industrial. Mechanical Trades Schools of the A. E. F., C. E. Lester. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 532-534, 8 figs. Organization of schools for intensive training in mechanical trades, in France after signing of armistice.

Lighting. See LIGHTING, Schools; VENTILATION, Schoolrooms.

Ventilation. See VENTILATION, Schools.

SCHOONERS

Auxiliary, Diesel-Engined. Diesel-Engined Auxiliary Schooners, C. E. Spinnler. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 402-405, 9 figs.; partly on 2 supp. plates. Details of machinery installed in Italian sailing vessel for auxiliary power. Vessel is 236 ft. long.

SCHOOP METAL SPRAYING

See METAL SPRAYING.

SCIENTIFIC MANAGEMENT

See INDUSTRIAL MANAGEMENT; TAYLOR SYSTEMS; TIME STUDY.

SCLEROMETER

See HARDNESS, Testing.

SCRAP

Metal, Briquetting. Briquetting of Metal Scrap, Adolph Bregman. Metal Industry (N. Y.), vol. 18, no. 9, Sept. 1920, pp. 400-402, 5 figs. Ronay three-stage press.

SCREW MACHINES

Automatic. Electric Speed Control for Cleveland Automatics. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 81-84, 10 figs. Mechanism which regulates amount of resistance in series with shunt field windings of adjustable-speed driving motor.

National Acme Multiple Automatics. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 771-774, 7 figs. Description and illustrations of 3- and 4-in. automatic screw machines designed for applying to production of large-sized work principle of completing all operations in time of longest cut.

See also German Automatic.

Cut-Off Cams for. Designing Cut-Off Cams for Automatic Screw Machines, John A. Crabtree. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 806-807, 2 figs. Account of trouble experienced in cutting off work, cause of cut-off trouble and method of eliminating it.

German Automatic. German Automatic Screw-Machine Construction (Der deutsche Automatenbau), Ph. Kelle. Der praktische Maschinen-Konstrukteur, vol. 53, no. 16, Apr. 22, 1920, pp. 57-63, 7 figs. Notes on calculation of cams. Gives details of a multiple screw machine of L. Loewe & Co., Berlin, for working up bar material of from 5 to 60 mm. diameter and for chucking work, also describes automatic built by Hahn & Kolb, Oberesslingen, on the same construction principle.

Hand. The Foster Line of Hand Screw Machines. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 953-954, 2 figs. Description of machines built in five sizes, two of which—the largest and smallest—are illustrated as being indicative of their general character.

Hand, Practice for. Hand Screw Machine Practice. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 620-624, 18 figs. Examples of work finished in hand screw machine, based on practice of Warner & Swasey Co., Cleveland, Ohio.

Interchangeable Design. Screw Machines of Interchangeable Design. Iron Age, vol. 104, no. 24, Dec. 11, 1919, pp. 1187-1189, 8 figs. Line of screw machine embracing five sizes, with corresponding bar capacities to 7/16 to 1 13/16 in.

Large Four-Spindle. Four-Spindle Screw Machines for Large Work. Iron Age, vol. 105, no. 14, April 1, 1920, pp. 935-939, 13 figs. Machines are evolution in development of multiple-spindle screw machines to meet requirements of users for machines for larger diameter work than could be produced on 2¼-in. machines. They are built by National Acme Co., Cleveland.

[See also MACHINERY, Power Requirements of.]

SCREW PROPELLERS

See AEROPLANE PROPELLERS; PROPELLERS, SHIP.

SCREW THREADS

Acme, Gaging. Gaging Acme Threads Without Special Wires, H. A. Pearson. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, p. 830, 1 fig. Equations are given which, it is said, can be applied to any wire which may be available.

British Association. Interim Report on British Association (B. A.) Screw Threads with Tolerances for Nos. 0 to 15 B. A. British Eng. Standards Assn., no. C. L. (M.) 7271, June 1919, 15 figs. It is recommended that form of thread adopted by British Assn. Small Screw Gauge Committee be used on all screws below ½-in. diameter.

Interim Report on British Standard Whitworth (B. S. W.) Screw Threads and Their Tolerances. British Eng. Standards Assn., no. C. L. (M.) 7270, June, 1919, 21 pp., 2 figs. Association recommends that either British Standard Whitworth or British Standard Fine Threads be used on all screws of ¼ in. and above and British Assn. Thread for all screws below ¼ in., excepting 7/32-in. screw, which is recommended to be used as continuation of B. S. F. in preference to B. A.

Comparator for. A Practical Comparator for Screw Threads, James Hartness. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1057-1059, 9 figs. Projection type of apparatus which shows resultant effect of errors in lead, form of thread, smoothness of surface and diameter, and includes tolerance measurement, that insures interchangeability and prevents accept-

ance of undersized and undependable screws.

Conical. Device for Cutting Conical Screw Threads (Vorrichtung zum Schneiden von konischem Aussen- und Innengewinde), Metall-Technik, vol. 46, no. 25-26, June 28, 1920, p. 97, 2 figs. Describes patented device for cutting internal and external threads which can be attached to any lathe, and is especially adapted to the machining of workpieces of large diameter, such as pipe sleeves, nipples, etc.

Gages. See GAGES, Screw-Thread.

Hose-Coupling. See HOSE COUPLINGS, Threads.

Measuring Instruments. Screw Thread Measuring Instruments. Eng. Production, vol. 1, no. 6, June 1920, pp. 221-225, 13 figs. Machines designed by Metrology Department of National Physical Laboratory, England.

Metric. See also Standardization.

National Screw Thread Commission. National Screw Thread Commission Report. Mech. Eng., vol. 42, no. 6, June 1920, pp. 337-345. Commission is composed of engineers and government representatives, and was appointed by Act of Congress, July 16, 1918, to investigate and collate standards for screw threads to be adopted by manufacturing plants under the control of the Army and Navy, and also for adoption and use by the public. Report covers standards for threads and thread gages, including tolerances.

National Screw-Thread Commission Report on Coarse and Fine Threads. Am. Mach., vol. 53, nos. 11 and 12, Sept. 9 and 16, 1920, pp. 507-512 and 543-546, 4 figs. Sept. 9. Commission was created by Act of Congress, July 18, 1918, for purpose of ascertaining and establishing standards for screw threads for use of various branches of Federal Government and for use of manufacturers. Sept. 16. Tables of manufacturing tolerances for gages, and typical specifications for screw-thread production.

Pipe Threads. See PIPE THREADS.

Pitch and Angle Errors, Compensation of. British Standard Tables, for Use in Engineering Workshops giving Corrections to Effective Diameter Required to Compensate Pitch and Angle Errors in Screw Threads of Whitworth Form. British Eng. Standards Assn., no. 95, December 1919, 59 pp.

Square, Milling. Milling Square Threads, Francis W. Shaw. Machy., vol. 15, no. 385, Feb. 12, 1920, 627-630, 5 figs. Attempts to evolve cutter to mill square thread are reviewed and it is concluded that "while the possibility exists of cutting by thread milling an approximately correct square thread, the expense of making special cutters is not warranted in view of the existence of the readily-producible 'acme' thread."

Standardization. Historical Synopsis of Work Undertaken by the Société d'Encouragement pour l'Industrie Nationale with a view to standardizing Systems of Threads Employed in Mechanical Constructions by Introducing in These Systems the Metric and Decimal Systems (Résumé historique des travaux entrepris par la Société d'Encouragement pour vue d'assurer l'unification des systèms de filetage employés dans les constructions mécaniques par application a ces filetages du système métrique et du système décimal). Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 131, no. 5, Sept. and Oct. 1919, pp. 177-216, 6 figs. A bibliographic list of documents on screw threads published by the Société is appended and also a report of the Union des Syndicats de l'Électricité in which a comparison is made of the dimensions of bolt, screws and notes adopted by the Congress of Zurich and Société d'Encouragement, the Schneider works, the French Railways and the Chambre Syndicale des Constructeurs d'Automobiles.

Tight-Fitting. Tight-Fitting Threads for Bolts and Nuts, Chester B. Lord. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 222-224 and 259, 5 figs. Conclusions drawn from experimental work are in part: Cause of stripped threads is lack of room into which metal can flow; pitch diameter and lead should be the same in both threads; and thread angle should differ by not more than 10 deg.

Whitworth. See British Association.

Worm-Gear. Thread Forms for Worms and Hobs, B. F. Waterman. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 872-873, 5 figs. Mechanical problems involved in construction and operation of worm gears. Writer believes it is desirable to establish and follow standard line of procedure in manufacture of worm gears as their use is increasing rapidly, and suggests adoption of straight-sided cutters with change in pressure handle at same sided angle of helix and change of axial to normal depth at same point.

SCREWS

Measuring Machine. A New Screw-Measuring Machine, P. E. Shaw. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 816-817, 4 figs. Suggested simplification of machine described in Engineering, Jan. 24, 1919, p. 104. Principle employed is to measure profile of imaginary axial section of screw whether plug or ring.

Studs. See STUDS.

Tension. See BOLTS, Tension.

[See also SCREW PRODUCTS.]

SEA WALLS

Concrete Facing for. Concrete Facing Placed on Old Masonry Sea Wall. Eng. News-Rec., vol. 84, no. 21, May 20, 1920, pp. 996-998, 6 figs. West Indian store quay wall protected against underwash and erosion by precast pile and slab structure.

Galveston. Extending the Galveston Sea Wall, J. B. Lippincott. Eng. News-Rec., vol. 83, no. 13, Sept. 25, 1919, pp. 617-619, 8 figs. Illustrating building of wall with maximum use of mechanical aid.

SEA WATER

Effect on Structures. See STRUCTURES, Deterioration in Sea Water.

SEAMLESS TUBES

See TUBES, Seamless, Manufacture.

SEAPLANES

Air Ministry Competition. The Air Ministry Seaplane (Amphibian) Competition. Flight, vol. 12, no. 39, Sept. 23, 1920, pp. 1013-1021, 22 figs. Description of machines entered in British air ministry competition for amphibian machines.

Berthing of. The Berthing of Giant Seaplanes (Die Bergung von See-Grossflugzeugen), Fritz Hammer. Verkehrstechnik, vol. 37, no. 8, Mar. 1920, pp. 109-110, 3 figs. Description of a large hangar which serves as a harbor for hydroplanes, erected on a pile foundation in the water in immediate vicinity of coast; and of a raft floating about a stationary point, measurements of which conform with those of door opening, and by means of which it is possible to bring machine in under all weather conditions.

Carrier. The New British Seaplane Carrier Hermes, Frank C. Bowen. Rudder, vol. 35, no. 12, Dec. 1919, pp. 549-550. Dimensions

are 558 feet 6 inches over all by 70 feet breadth by 18 feet draft.

Commercial. German Commercial Seaplanes (Deutsche Verkehrs-Seeflugzeuge), Werner v. Langsdorff. Schiffbau, vol. 21, no. 33, July 7, 1920, pp. 902-906, 12 figs. Details of types developed by the Sablatnig, the Air Traffic Co., Lübeck-Travemünde Aeroplane Works, Junkers, Zeppelin-Staaken and Aircraft Co.

The Ricci Commercial Seaplane R-I. Aviation, vol. 8, no. 9, June 1, 1920, pp. 365-366, 2 figs. Specifications: Span, upper and lower plane, 85 ft. 9 in.; overall length, 42 ft. 10 in.; maximum height, 13 ft. 10 in.; total wing area, 1,300 sq. ft.; weight loaded, 10,920 lb.; total hp., 660 hp.; max. horizontal speed, 100-110 m.p.h.; endurance, 4 hr.

Design. See AEROPLANE ENGINES, Design.

Engine Design. See AEROPLANE ENGINES, Design.

Floats. Strength Tests of a Wooden and a Duralumin Float (Festigkeitsprüfungen eines Holz- und eines Duralschwimmers), Von Viktor Lewe. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 3, Feb. 14, 1920, pp. 37-40, 9 figs. Results of experiments are said to show that both wooden and duralumin floats are constructed according to principles that do not always coincide with static requirements. From standpoint of seaworthiness, only the duralumin float is regarded as sufficiently strong.

Forest Mapping with. See FORESTRY, Use of Seaplanes in.

German. See Commercial.

Hull Design. Design of the Hull of a Seaplane (Étude sur les coques d'hydravions), Maurice Blanchard. Aérophile, vol. 28, nos. 7 and 8, April 1 and 15, 1920, pp. 98-103, 18 figs. Suitabilities of different shapes.

Landing Gears. The Shape and Strength of Seaplane Landing Gears with Special Consideration of Their Seaworthiness (Form und Festigkeit der Seeflugzeugunterbauten mit besonderer Berücksichtigung der Seefähigkeit), Von Viktor Lewe. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 9, May 15, 1920, pp. 124-128, 12 figs. Notes on stresses of landing gear as determined by calculations and tests; recommendations for calculating rules; improvements in forms of carriage, float and boats.

Mooring Dock. Bristol Mooring Pontoon for Hydro-Aeroplane. Flight, vol. 12, no. 8, Feb. 19, 1920, pp. 201-202, 3 figs. Describes small floating dock moored to a buoy so as always to be kept head to wind, and upon which machine is docked.

[See also AEROPLANES, Load Factors; FLYING BOATS.]

SEARCHLIGHTS

Aeroplane. Coöperation of Aeroplane Searchlights in Anti-Aircraft Defense, W. F. Tompkins. Military Engr., vol. 12, no. 63, May-June 1920, pp. 265-270 and (discussion) 270-271, 6 figs. It is believed that, in the future, the principal use of army searchlights will be in conjunction with the air service to combat night bombers and it is regarded as desirable that the same service should operate all the correlated equipment of a semi-fixed searchlight installation.

Carbon-Arcs for. Carbon Arcs for Searchlights, C. C. Paterson, J. W. T. Walsh, A. K. Taylor and W. Barnett. Jl. Inst. Elec. Engrs., vol. 58, no. 287, Jan. 1920, pp. 83-97 and (discussion) pp. 97-106, 20 figs. See also Elecn., vol. 83, no. 2168, Dec. 5, 1919, pp. 625-627, 6 figs. Experiments at National Physical Laboratory undertaken at request of British Admiralty, with object (1) to develop the best method of testing carbons in order to prove their value for searchlights, (2) to compare relative qualities of existing carbons, other than flame carbons, for producing high-intensity searchlight beams, (3) to determine what improvement can be made either in the carbons themselves or in the methods of burning them.

French Types. Large Electrical Projectors Used During War (Les projecteurs électriques de gros calibre pendant la guerre), Marius Grosjean. Revue générale de l'Électricité, vol. 6, nos. 15 and 16, Oct. 11 and 18, 1919, pp. 479-487, and 513-527, 52 figs. Breguet and Sauter-Harle types, 90 cm. in diameter. Breguet, Benard, Barbier and Turenne types of 150 cm. diameter.

Military. Military Searchlights, S. G. Hibben. Proc. Engrs. Western Pennsylvania, vol. 36, no. 2, Mar. 1920, pp. 81-101 and (discussion) pp. 102-108, 13 figs. Researches which led to designs used by Am. Expeditionary Forces.

Searchlights for Military Uses, M. L. Patterson. Jl. U. S. Artillery, vol. 53, no. 4, Oct. 1920, pp. 383-396, 9 figs. Points out usefulness of the Sperry high-intensity searchlight during the war and its potential possibilities for usefulness in case of war. Details of various types of searchlights.

U. S. Navy, Improvement in. The Searchlight in the U. S. Navy, Ralph Kelly. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 12, Dec. 1919, pp. 1369-1384, 11 figs. Changed form of 12-in. incandescent light suggested which, it is claimed, will insure lamp-bulb filament always being at focal point of mirror.

[See also SHIPS, Searchlights for.]

SELENIUM

Applications. Practical Applications of Selenium, Louis Ancell. Sci. Am. Monthly, vol. 1, nos. 2 and 3, Feb. and Mar. 1920, pp. 157-159, 4 figs., and 253-255, 5 figs. Feb.: Its utilization in biological chemistry and in glass and rubber industries. Mar.: Utilization for controlling draft of factory chimneys and in telemechanics. Translated from Chimie et Industrie.

Cells. Selenium Cell with Built-In Compensator Cell (Selenzelle mit eingebauter Kompensatorzelle), W. S. Gripenberg. Elektrotechnische Zeitschrift, vol. 41, no. 23, June 10, 1920, pp. 453-454, 1 fig. Two currents in opposite direction are sent through a selenium plate. One of the current paths can be exposed to light in order to obtain compensation of (1) spontaneous resistance variations of the selenium, (2) temperature variations, (3) partial effects of inertia, (4) sudden variations through electrochemical causes.

Illumination and Electrical Conductivity. On the Relation between Illumination and Electrical Conductivity in Selenium, A. O. Rankine. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 482-488, 2 figs. It is concluded from experiments with selenium cells that ultimate increase of conductivity of selenium is proportional to fourth root of light intensity.

Uses. General Applications of Selenium, Louis Ancell. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 28-29. Its utilization in biological chemistry and in glass and rubber industries.

Selenium and Some of Its Uses, Philip R. Coursey. Wireless World, vol. 8, no. 5, May 29, 1920, pp. 145-149, 5 figs. Discussion of origin and forms of selenium and its use in photometry, in signaling without wires in telegraphy and telephony, using light rays as connecting link between stations, and in instrument called optophone designed with object of

enabling the blind to read printed type by means of sound.

Selenium and Tellurium, Victor Lenher. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 597-598. Uses in iron and steel industries, glass manufacture, medicines and rubber and dye industries. Report of Committee of Nat. Research Council presented to Am. Chem. Soc.

[See also FLAME REACTIONS, Selenium and Tellurium.]

SELF-INDUCTION

Measurement of. See CAPACITY, Measurement of.

SEMI-DIESEL ENGINES

Marine. See Tuxham.

Tuxham. The Tuxham Marine Crude Oil Engines. Practical Engr., vol. 62, no. 1754, Oct. 7, 1920, pp. 234-236, 3 figs. Semi-Diesel type built on two-stroke principle.

Two-Cycle. Two-Stroke Cycle Semi-Diesel Oil Engine. Eng., vol. 110, no. 2855, Sept. 17, 1920, pp. 376 and 378, 7 figs. Built by Consolidated Pneumatic Tool Co., Ltd., London, England. Instead of employing crankcase compression engine is fitted with special compression chamber at front end of cylinder.

Vickers-Petter. Vickers-Petter Semi-Diesel Marine Oil Engine. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 246 and 248, 5 figs., 4 on supp. plate. Described as 2-cycle type with crankcase compression, and made in sizes from 10-b. hp. to 450-b. hp. with from one to six cylinders.

SEMI-STEEL

Manufacture. Manufacture of Semisteel for Shells, Frank E. Hall. Min. & Metallurgy, no. 157, section 15, Jan. 1920, 7 pp. Requirements of U. S. Ordnance Department.

[See also CAST IRON, Synthetic.]

SENSITOMETER

See PHOTOGRAPHY, Sensitometer.

SEPARATORS

De Laval. Centrifugal Machines Recover and Purify Oil. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 972-973, 4 figs. De Laval separators.

Magnetic. See MAGNETIC SEPARATORS.

Steam. The Steam Separator, A. J. Dixon. Southern Engr., vol. 32, no. 4, Dec. 1919, pp. 38-41, 13 figs. Explanation of benefits obtained by separating moisture from steam, together with description of mechanical principles of various devices so employed.

SEPTIC TANKS

Hospital, India. Some Sanitary Installations, and an Experiment, in Patna, F. C. Temple. Indian Eng., vol. 68, no. 17, April 24, 1920, pp. 234-236, 3 figs. on 3 supp. plates. Septic tanks and filters for hospital.

SERIES

Ultra-Spherical. New Observations on Ultra-Spherical Series (Nouvelles observations sur les séries ultra-sphériques), Erwand Kogbetliantz. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 9 and 18, Sept. 1 and Nov. 3, 1919, pp. 423-426 and 769-770. Concerning summation of ultraspherical development of $f(x)$ in interval $(-1, +1)$. Reference is made to theorems given in C. R. vol. 169, 1919, p. 322.

SEWAGE

Nitrogen in. The Nitrogen in Sewage, G. McGowan. Surveyor, vol. 57, no. 1477, May 7, 1920, pp. 405-407. Notes on nitrogen in solution and insoluble nitrogen in sewage, utilization of sewage, activated sludge process, and fat in sewage.

Screening. Results of 1918 Operations of Testing Station of Milwaukee Sewerage Commissions. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 669-671, 1 fig. Experiments demonstrated that revolving screen with slots 2 in. by ⅛ in. working under 2-in. loss of head handled 3,000,000 gal. of sewage upon 27 sq. ft. of wet screen area per day and removed 150 lb. of dry solids per 1,000,000 gal., and that activated sludge tanks 15 ft. deep treated affluent from such screen at rate of 16.5 million gal. per acre per day.

SEWAGE DISPOSAL

Acid vs. Chlorine Process. Sewage Purification —Miles Acid System Compared with Chlorine Process. Public Works of the Navy, Under the Cognizance of the Bureau of Yards and Docks and the Corps of Civil Engineers, U. S. Navy, Bul. no. 31, Apr. 1920, pp. 84-93, 5 figs. Based on practice at U. S. Navy training camp.

Activated Sludge. Activated-Sludge Experiments at Mount Vernon, N. Y., R. H. Eagles. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 490-492, 2 figs. Dorr-Peck Process which differs from former methods in application of different mechanical principles to introduction of air and circulation of sludge, resulting in lower air consumption and higher nitrogen recoveries in sludge.

Activated-Sludge Experiments at Worcester, Massachusetts, Ray S. Lamphear. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 819-823, 2 figs. Year's study of new process is said to have shown it not to be so well adapted to Worcester sewage as Imhoff tanks and sprinkling filters.

Activated-Sludge Plant for the City of Milwaukee, T. Chalkley Hatton. Eng. News-Rec., vol. 84, no. 21, May 20, 1920, pp. 990-996, 1 fig. Plans adopted for 85,000,000 gallons of sewage in 1930 and 130,000,000 in 1950. Bar screens, grit chambers and fine screens precede activation. Sludge acidified, pressed and dried for fertilizer.

Manchester's Experience with Activated Sludge. Contract Rec., vol. 34, no. 8, Feb. 25, 1920, pp. 180-182. Excerpts of report of Manchester (Eng.) River Department in which reference is made to activated sludge sewage purification plant in that city. Average of 172,000 gal. per day of sewage, which are screened and passed through detritus tanks, are treated. Tabulated data on typical average analytical returns.

Albany, N. Y. See Foaming, Prevention of.

Army Camps. Sewerage, Sanitation and Reclamation at U. S. Army Camps, Leonard J. Doten. Jl. Western Soc. Engrs., vol. 24, no. 5, May 1919, pp. 263-275 and (discussion) pp. 275-281, 11 figs., partly on three supp. plates. Scheme adopted for cantonments consisted of classification and separation of waste materials in such manner as to secure greatest amount of revenue from sale of material; all wastes were collected by means of duplicate can system. Garbage and other wastes were disposed of by sale to contractors.

Brooklyn, N. Y. Some Results of the Brooklyn, N. Y., Sewage Treatment Experiments. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, pp. 39-41. Data pertaining to Imhoff tank operation, trickling filters, etc.

See also Data on.

Chemical Precipitation. The Preliminary Treatment of Sewage, James H. Edmondson. Surveyor, vol. 58, no. 1487, July 16, 1920, pp. 41-44. Laboratory and practical experiments for the separation of solids and liquids in sewerage by chemical precipitation. Results applicable to all methods of tank treatment.

Cleveland Plan. The Design of Cleveland's Sewage-Treatment Works, George B. Gascoigne. Eng. News-Rec., vol. 85, no. 8, Aug. 19, 1920, pp. 344-349, 3 figs. Three plants to protect bathing beaches and prevent nuisances in Cuyahoga River. Gratings, grit chambers and two-story tanks with disinfection for two lake-front plants.

Data on. Sewage Treatment, Methods and Experiments, George T. Hammond. Fire & Water Eng., vol. 67, no. 24, June 16, 1920, pp. 1278-1282, 8 figs. Plans adopted in Brooklyn, N. Y. and account of experimental work. From study in sedimentation it is concluded that retention period of sewage in passing through settling chamber should be short—not less than one, or more than three hours; depth of digestion chamber at mouth of sludge pipe should not be less than 20 ft. from water line of tank, etc. The two Riensch-Wurl screens are said to have given reliable and excellent results. Description of sprinkling filters, etc.

Direct Oxidation Process. A New Method of Sewage Disposal. Nat. Lime Assn., bul. no. 200, 1920, 15 pp., 1 fig. Direct oxidation process for treatment of municipal sewage. Method consists of electro-chemical treatment with lime.

Dortmund Tank. "Dortmund" Sewage Tank. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, pp. 104-107, 7 figs. Sewage is discharged from carrier into cast-iron supply pipe serving 24-in. down pipe at center of tank, this pipe terminating 14 ft. below top so that sewage may be deposited within conical portion.

Doten Tank. Sewering War-Time Housing Developments. Mun. Jl. & Public Works, vol. 48, no. 2, Jan. 17-24, 1920, pp. 25-28, 3 figs. Doten tank as modified in Emergency Housing Projects for Construction Division of War Department.

Electrolytic Treatment. Electrolytic Sewage Treatment, Robert H. Craig. Eng. News-Rec., vol. 85, no. 1, July 1, 1920, pp. 25-26. Review of a half century of invention and promotion, from which conclusion is drawn that electrolytic processes will probably not supplant treatment of sewage by natural biological processes, such as in septic tanks and filters.

Foaming, Prevention of. The Albany Sewage Treatment Plant. Public Works, vol. 48, no. 20, May 29, 1920, pp. 463-464. Foaming is said to have occurred during first nine months of operation, but was apparently conquered by reversing flow; efficiency averaged 67 per cent.

Gases, Utilization of. Power Plants in Connection with Clarification Plants (Kläranlage-Kraftwerke), G. Strassburger. Gesundheits-Ingenieur, vol. 42, no. 33, Aug. 16, 1919, pp. 329-337, 2 figs. Suggests utilizing gases freed during process for lighting purposes, etc.

Hospital, Ft. Sheridan. Design of New Sewage Treatment Works at Fort Sheridan (Ill.), General Hospital No. 28, H. R. Abbott. Municipal & County Eng., vol. 58, no. 5, May 1920, pp. 212-216, 4 figs. Treatment works consist of a diversion box, septic tank, dosing chamber, trickling filter, chlorinating and humus chamber, secondary settling tanks and sludge drying beds, all of which are described.

Imhoff Tanks. Operating Experiences with Imhoff Sewage Tanks, W. G. Kirchoffer. Mun. & County Eng., vol. 58, no. 3, Mar. 1920, pp. 107-110, 2 figs. Experiences are quoted which, in writer's opinion, have established that sludge can be much more readily digested by discharging raw sewage into sludge chamber than into sedimentation chamber.

Some Small Imhoff Tanks, W. A. Hardenbergh. Public Works, vol. 49, no. 6, Aug. 7, 1920, pp. 122-126, 8 figs. Plans prepared by state health boards and others for sewage treatment plants for schools and institutions and small communities. Various retention periods and capacities per capita are recommended for different designs and different sizes.

Isolated Homes. Studies of Methods for the Treatment and Disposal of Sewage. The Treatment of Sewage from Single Houses and Small Communities, Leslie C. Frank. U. S. Treasury Dept. Public Health Service, bul. no. 101, Dec. 1919, 117 pp., 26 figs. Experiments conducted to determine suitability of various devices for treatment of sewage from small communities or isolated country homes.

Milwaukee, Wis. See Activated Sludge.

Mining Towns. Pennsylvania Mining Town Constructs Its Own Sewage-Disposal Plant, Donald J. Baker. Coal Age, vol. 18, no. 15, Oct. 7, 1920, pp. 723-727, 7 figs. Plant at Langeloth, Washington County, Pa. Sewage passes through disposal plant that yields two products, one a colorless, odorless, harmless, bacteria-free water, and the other an excellent germless fertilizer.

Ocean Disposal. Ocean Sewage Disposal in Relation to Bathing Beaches, Lynn Perry. Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 640-641, 3 figs. Series of investigations conducted by State Department of Health of New Jersey. It was concluded that thoroughly settled sewage, when discharged into ocean well outside of surf, is not likely to impair bacterial quality of water at bathing beaches.

Plainfield, N. J., Plant. Plainfield's Sewage Treatment Plant. Mun. Jl. & Public Works, vol. 47, no. 22, Nov. 29, 1919, pp. 318-322, 7 figs. Details of operation of Imhoff tanks and sprinkling filters.

Preliminary Treatment. The Preliminary Treatment of Sewage, James H. Edmondson. Contract Rec., vol. 34, nos. 33 and 34, Aug. 18 and 25, 1920, pp. 794-796 and 814-816. Laboratory and practical experiments consisting of (1) addition of ferric sulphate to sewage at rate equivalent to 4 grains per gal.; (2) addition of 2 grains per gallon of ferric sulphate, plus 2 grains per gal. of lime; and (3) addition of 1.0 grains per gal. of aluminum sulphate and 2.8 grains per gal. of lime. Paper read before Assn. of Managers of Sewage Disposal Works (British).

Purification. A Process for the Purification and Deodorization of Sewage (Verfahren zur Reinigung und Geruchlosmachung schmutziger Abwässer). Zeitschrift für Transportwesen u. Strassenbau, vol. 36, no. 11, Apr. 10, 1919, pp. 124-125. Description of a purification process recently patented, in which the sewage is first treated with small quantities of chlorides or sulphates.

The De-Watering of Sewage Sludge, with Special Reference to the Birmingham Method, F. R. O'Shaughnessy. Surveyor, vol. 58, no. 1491, Aug. 13, 1920, pp. 111-112. In Birmingham process of rapid chemical degradation of organic contents of sludge is effected by promoting intensive fermentation in the mass, under controlled conditions. Experience during eight years of operating Birmingham installation is related. Paper presented to Engineering and Architecture Section, Royal Sanitary Institute Congress, Birmingham.

Schrank Settling Tank. Purification of Sewage and the Disposal and Utilization of Precipitated Sludge with Special Reference to the Schrank

Settling Tank (Einiges über die Klärung von Abwässern, sowie die Beseitigung und Verwertung des ausfallenden Schlammes, unter besonderer Würdigung der Schrankschen Klärbrunnen), Friedrich Schrank. Gesundheits-Ingenieur, vol. 43, no. 17, Apr. 24, 1920, pp. 196-201, 9 figs. Details of combined precipitation and putrefaction basin which is said to separate putrefying sludge in continuous operation entirely automatically and in such a manner that the actual purification process is insured against disagreeable disturbances through putrefaction or fermentation.

Septic Tanks. See SEPTIC TANKS.

Sludge Handling. Sewage-Disposal Difficulties at Madison, Wisconsin. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1079-1080. How sludge handling was improved by hoppers and new pipe connections.

Sewage Sludge Economic Value, Raymond Wells. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 27-31. How Cobwell process, which is usually applied to handling of municipal garbage, dead animals, slaughter-house offal and other wet organic waste materials, has been applied to sewage sludge. Paper read before Am. Soc. for Municipal Improvements.

Sludge Treatment. See Activated Sludge; WASTE, Trade, Treatment of.

Sludge Utilization. By-Products from Sewage Sludge, Robert Spurr Weston. Am. Jl. Public Health, vol. 10, no. 5, May 1920, pp. 405-409. It is maintained that most promising of sludges from standpoint of recovery of by-products therefrom are those of activated sludge and the Miles processes, and the more valuable Miles process sludge contains less water and is said to be much more stable than the bulkier and partially de-fatted activated sludge.

The Utilization of Sewage Sludge, John D. Watson. Mun. Jl. & Public Works, vol. 47, no. 14, Oct. 4, 1919, pp. 210-213, 3 figs. Summary of results and conclusion from experiments conducted for several years at Birmingham, England. Digestion of sludge in separate tanks in two stages. Avoidance of odor. Paper read before Inst. of Min. & County Engrs. Also in Can. Engr., vol. 37, no. 18, Oct. 30, 1919, pp. 420-422 and 427-429, 8 figs.

Testing Apparatus. Sewage-Treatment Report Forms and Testing Apparatus, E. J. Tully and James H. Mackin. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 825-826, 2 figs. Monthly blank sheet for daily test records and apparatus for finding settleable solids and sludge depths.

[See also PACKING HOUSES, Waste Disposal.]

SEWAGE PLANTS

Electrolytic. Idle Electrolytic Sewage-Works in Oklahoma. Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 135-136, 1 fig. Official report of engineer of state department of public health is quoted as saying that "average municipality will not give sufficient attention to an electrolytic plant to justify expenditure of an installment."

Screening Plant. Operating Results of Dyckman Street Sewage-Screening Plant, Charles E. Gregory. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 171-172. Table giving results of tests of Riensch-Wurl screens.

[See also SEWAGE DISPOSAL.]

SEWAGE PUMPING

Plants. Bridgeport's Sewage Screen and Pumping Station, James A. McElroy. Mun. Jl. & Public Works, vol. 47, no. 15, Oct. 11, 1919, pp. 224-226, 2 figs. Description of underground station, disc screen and centrifugal pumping plant now under construction.

Walkerville Underground Sewage-Pumping Plant, Charles W. Tarr. Can. Engr., vol. 37, no. 18, Oct. 30, 1919, pp. 415-417, 7 figs. Circular, two-story, reinforced-concrete structure, approximately 23 ft. diameter and 20 ft. high, built entirely below ground level excepting housing for stairway.

SEWAGE TREATMENT

See SEWAGE DISPOSAL, Plants.

SEWER CONSTRUCTION

Bank Slides in. Earth Slips Prove Disastrous to Open-Cut Sewers. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 989-991, 5 figs. Methods devised to correct trouble arising from bank slides and bottom upheavals in work on Detroit sewers.

Brooklyn, N. Y. Ralph Avenue Sewer, Brooklyn. Public Works, vol. 48, no. 7, Feb. 28, 1920, pp. 145-146, 3 figs. Details of construction. Account of deep-sheeted trench excavated by steam shovel and clamshell buckets and large invert concreted far in advance of arch. Plant is said to be largely operated by electric power.

Calculations in. Expedients for Sewer Calculation (Hilfsmittel für die Kanalberechnung), H. Kräwinkel. Gesundheits-Ingenieur, vol. 42, no. 41, Oct. 11, 1919, pp. 417-424, 6 figs. Sewer calculations are discussed referring to relations between such variable quantities as water volume and velocity, hydraulic radius, sewer cross-section, velocity, coëfficients, degree of roughness, etc. Graphic and logarithmic tables are included.

Costs. Method of Estimating Sewer Construction Costs, George C. D. Lenth. Eng. News-Rec., vol. 85, no. 1, July 1, 1920, pp. 22-24, 2 figs. Gives diagrams based on average gang performance; costs tabulated for quick reference; typical gangs and average machine outputs.

Pneumatic Construction. Pneumatic Method Employed in Constructing Sewers Proves Economical. Eng. World, vol. 16, no. 2, Jan. 15, 1920, pp. 57-59, 3 figs. It is reported that pneumatic method proved economical in constructing sewer.

SEWER DESIGN

Backwater Curves. Computation of Backwater Curves in Sewer Design, C. D. Hill. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 164-167, 2 figs. Curves show hydraulic elements for circular and horseshoe sewers for uniform discharge and varying depths.

SEWER PIPE

Specifications. Los Angeles Sewer Pipe Specifications. Public Works, vol. 48, no. 17, May 8, 1920, pp. 404-405. Recently adopted specifications give requirements for clay and cement pipe identical in most respects. Sand-bearing pressure, hydrostatic and absorption tests are made of both. Sewer joint compounds are provided for, and test for tightness of completed sewer.

SEWERS

Concrete, Cost of. Sewer Cost Lowered by Increasing Concrete Yardage in Section, John P. Wentworth. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 148-149, 2 figs. Simplification of form work said to have cut contractor's bid $2 per linear foot and to have saved $1000.

Concrete, Specifications for. Concrete Sewer Standard Specifications. Public Works, vol. 48, nos. 14 and 15, Apr. 17 and 24, 1920, pp. 335-337 and 355-356. Report of Committee on Concrete Sewers of Am. Concrete Inst., con-

taining tentative standard specifications for construction of concrete pipe, arch and slab sewers. Requirements proposed for adoption as standard include features commonly used in advanced structure practice and give special attention to invert construction, arch forms, backfilling, etc.

Construction. See SEWER CONSTRUCTION.

Design. See SEWER DESIGN.

Excavation. See TRENCH DIGGING, Steam-Shovel.

Multiple-Outlet. Multiple Outlet Provides for Variable Sewage Flow, S. T. Smetters. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 728-730, 4 figs. Regulation and distribution of sewage discharge through seven outlets into Calumet-Sag Canal.

Storm-Water Drain Design. A Diagram Adaptation of the Rational Method of Storm-Water Drain Design, Harold G. McGee. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 868-872, 7 figs. Review of maps, population estimates, rainfall intensities, probability charts and various instruments and methods associated with storm-sewer design, and illustration of how diagram is used.

Ventilation. Sewer Ventilation and Health, William Brown. Soc. Engrs., Jl. and Trans., vol. 10, no. 9, 1919, pp. 247-261 and (discussion) 261-278, 2 figs. Writer contends that "constant, efficient ventilation of each whole system of sewerage is the dominant desideratum in the solution of public health problems" and offers arguments in substantiation of this proposition by studying conditions in London sewers, noting how formation of sewer gas is prevented by sewer ventilation.

SEWING MACHINES

Needles, Manufacture of. See NEEDLES, Sewing-Machine.

SHAFT SINKING

Great Depth. See EARTH, Internal Conditions.

Gyroscopic Compass, Use in. The Gyroscopic Compass in Shaft Sinking (Der Kreiselkompass im Schachtbau), O. Martienssen. Elektrotechnische Zeitschrift, vol. 41, no. 24, June 17, 1920, pp. 462-466 and (discussion) pp. 475-476, 17 figs. Describes arrangement and use of a bore hole inclinometer equipped with a gyroscopic compass and points out its advantages in shaft sinking by the freezing process, where the bore holes through water-bearing strata must be exactly parallel and vertical.

Iron Mines. See IRON MINES, Shaft Sinking.

Mines. A Water Problem in Shaft Sinking, James E. Harding. Eng. & Min. Jl., vol. 109, no. 4, Jan. 24, 1920, pp. 263-264, 4 figs. How pumping was tried from churn-drill hole at one side of shaft in order to dispose of excessive flow struck in sinking shaft in Atacama Desert, Chile.

Value of Low-Temperature Process for Shaft Sinking and the Limit of Its Usefulness from a Technical and Economic Standpoint (Der Wert des Tiefkälteverfahrens für den Schachtbau und die Grenzen seiner Anwendbarkeit von technischem und wirtschaftlichem Standpunkt, H. Krekler. Zeitschrift für die Gesamte Kälte-Industrie, vol. 26, no. 9, Sept. 1919, pp. 65-73, 1 fig. See also Glückauf, vol. 55, no. 1, Aug. 2, 1919, pp. 589-597, 1 fig. States reasons for use of low-temperature process in certain cases in preference to ordinary freezing process, but warns against its dangers and drawbacks.

Quicksand. Shaft Sinking Through Quick Sand Under Heavy Pressure, L. Sauvestre. Colliery Guardian, vol. 99, no. 3100, May 28, 1920, pp. 1495-1497, 9 figs. Shafting was 622 m. deep and was sunk down to 500 m. by freezing process and lined with cast-iron tubbing, sinking being continued and shafts bricked. Translated from Annales des Mines de Belgique.

[See also COAL MINING, Shaft Sinking Through Quicksand.]

SHAFTING

Flexible. A New Flexible Coupling. Engr., vol. 130, no. 3376, Sept. 10, 1920, p. 252. Type constructed by Wellman Bibby Co., Ltd., London, England. It is said one is being constructed to transmit 16,000 hp. for rolling mill running at 100 r.p.m.

[See also BEARINGS, BALL, Installation; SHAFTS.]

SHAFTS

Critical Speeds. Formula of Dunkerley for the Critical Velocity of Rotating Shafts: Demonstrations and Applications (La formule de Dunkerley pour la vitesse critique des arbres tournantes; démonstration et applications), M. Goupil. Annales des Ponts et Chaussées, vol. 51, no. 4, July-Aug. 1919, pp. 66-74. Review of applications which have appeared in technical press, notably Phil. Transactions of London, Proc. Roy. Soc. and Zeitschrift des Vereins deutscher Ingenieure.

Keyways, Influence of. On the Influence of Keyways on the Stress Distribution in Cylindrical Shafts, T. H. Gronwall. Trans. Am. Math. Soc., vol. 20, no. 3, July 1919, pp. 234-244, 1 fig. Mathematical expression of ratio between maximum stresses in keyed and full parts of shaft.

Standard. Standard Holes or Standard Shafts (Einheitsbohrung oder Einheitswelle), Otto Klein. Werkstattstechnik, vol. 14, no. 5, Mar. 1, 1920, pp. 129-136, 16 figs. Discusses Kühn's recommendations in article published in same journal (no. 24, p. 381, 1919), and points out certain defects in his recommendation of use of line shaft and seeks to demonstrate that it would be much simpler and more expedient to abandon use of standard holes altogether and employ only the standard shaft.

SHAPERS

Gear. See GEAR CUTTING, Gear Shapers.

SHEARS

Electric Drive. See PRESSES, Electric Drive.

Guillotine. See PRESSES, Inclinable.

SHELL MANUFACTURE

Dies for. Drawing a Deep Shell of Irregular Shape, Charles Ruiz. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 160-162, 10 figs. Principal details of dies used for successive operations in drawing and forming of shell of unusual form.

Drawing Press. Locomotive Used as a Shell Press. Eng., vol. 109, no. 2824, Feb. 13, 1920, p. 214, 9 figs. Buffer beam of engine was replaced by a much stronger one, built up of plates and sections, and fitted, in front of cylinder utilized for drawing-down operations, with the die holder, a kind of casing open at the side for inserting the dies one after another. Work was done at Bordeaux works of South of France Railway Co. Translated from Proc. Société des Ingénieurs Civils de France.

Watertown Arsenal Methods. Shells Require Uniform Castings, Herbert R. Simonds. Iron Trade Rev., vol. 65, no. 24, Dec. 11, 1919, pp. 1573-1578, 10 figs. Writer states that high-explosive shellmaking demands consistent ingots if percentage of discards is to be held to minimum. Description of methods employed at

Watertown (Mass.) arsenal in production of 14-in. high-explosive shells.

SHELLAC

Manufacture. Pure Gum Shellac, Chester H. Jones. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 715-721, 11 figs. Account of manufacture and suggested specifications for pure shellac varnishes.

SHELLS

Buried, Location of. Locating Metallic Objects and Apparatus Buried in Soil by Means of the "Alpha" Balance (La détermination de l'emplacement d'objets et d'appareils métalliques enfouis dans le sol par l'appareil "Alpha"), M. Bousquet. Vie Technique & Industrielle, vol. 1, no. 5, Feb. 1920, pp. 381-382, 5 figs. In each of two large wooden hoops are placed two coils of wire; a variable current flows through lower coil and the other forms part of telephone circuit. Hoops are held by suitable handle just above ground.

Design. Projectiles, Walter P. Boatwright. Jl. U. S. Artillery, vol. 53, no. 4, Oct. 1920, pp. 348-382, 20 figs. Points out that a projectile requires a high stability factor during the first part of its flight and a high rate of precession at summit of its trajectory, and states that "in our present state of ignorance of laws governing projectile design, ballistically efficient projectiles can result only from experimental firings to determine for various types and twists of rifling the best combination of the various elements which affect range and accuracy.

Driving Bands. See CASTING, Centrifugal.

[See also PROJECTILES.]

SHERARDIZING

Gas Furnaces for. Temperature and Time Very Important Factors in Sherardizing—Reasons Why Gas Furnaces Have Many Advantages Over Other Methods of Heating in This Process, Charles A. Drum. Am. Gas Eng. Jl., vol. 111, no. 26, Dec. 27, 1919, pp. 593-598, 3 figs. Claims that cost per ton with gas is lower than with any other fuel.

Practice. Electro-Sherardizing. Machy. (Lond.), vol. 16, no. 396, Apr. 29, 1920, pp. 97-100, 5 figs. Discussion of results obtained from use of machines developed by the General Electric Co. in which heat is generated by passing electric current through suitable windings, with special reference to practice of Wise Electro-Sherardizing Co., of Detroit.

Strength. See GALVANIZING, Modern Practice.

[See also RUSTPROOFING.]

SHINGLES

Cement-Asbestos. See ROOFING TILE, Concrete.

SHIP CONSTRUCTION

Alloy Steels, Use of. The Use of Stainless and Other Alloy Steels in Ship Construction, Leslie Aitchison. Eng. & Indus. Management, vol. 3, no. 18, Apr. 29, 1920, pp. 553-556. Author discusses problem of use of alloy steel for ship plates in all its aspects, and although he does not think it possible to use non-carbon steel for ship plates, he is of opinion that stainless steel can be used for many of smaller parts and components of ships, which he outlines.

Bulkhead Watertight Door Indicators. The Works and Products of Messrs. Barr and Stroud, Limited. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 846-849, 13 figs. Watertight door indicators for ships' bulkheads.

Bulkheads. A Test of Watertight Bulkheads for Ship Subdivision, Archibald Hogg. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 2, Dec. 1919, pp. 33-47 and (discussion) pp. 49-68, 9 figs. Tests made in 1915 on flat-plate bulkhead constructed to recommendations of Bulkhead Committee, and others containing new features.

Stiffened Bulkheads Without Knee Plates—A New Bulkhead Construction Type (Versteifte Schotte ohne Knieblech—Eine neue Schottbauart), H. Erbach and G. Schulze. Schiffbau, vol. 21, no. 32, June 30, 1920, pp. 871-873, 12 figs. Describes new construction in which smooth side and stiffened side offer equal resistance to pressure.

Castings. Castings Used in Ship Construction, Ben Shaw and James Edgar. Foundry Trade Jl., vol. 21, no. 213, 214 and 215, Sept., Oct. and Nov. 1919, pp. 635-639, 717-728 and 815-823, 88 figs.; and vol. 22, no. 222, June 1920, pp. 453-458, 36 figs. Also in Foundry, vol. 47, nos. 19, 20 and 21, Nov. 15, Dec. 1 and 15, 1919, pp. 832-835, 870-873 and 902-905, 48 figs. Method of preparing bearings for pit molding propeller shaft bracket. Bollards and fairleads.

See also PROPELLERS, SHIP, Shaft Brackets.

Costs. How to Determine Shipyard Costs, Creighton Churchill. Mar. Rev., vol. 49, no. 12, Dec. 1919, pp. 586-589, 10 figs. Study of factors entering into ship construction costs with outline of method for adapting findings to different yards. Paper presented before Soc. of Naval Architects & Mar. Engrs.

Cruiser Stern in Merchant Ships. The Cruiser Stern in Merchant Shipbuilding. Shipbuilding and Shipping Rec., vol. 14, no. 26, Dec. 25, 1919, pp. 736-738, 12 figs. Instances in which adoption of cruiser stern is said to have effected saving in power and running costs.

Electric Welding in. See ELECTRIC WELDING, Ship Construction.

Fabricated. Fabricated Steel Ship Construction, J. P. Ewin. Proc. Louisiana Eng. Soc., vol. 6, no. 2, April 1920, pp. 103-126, 16 figs. Methods of Doullut & Williams, Shipbuilding Co., Inc., New Orleans.

Hull Testing. Testing the Hull Structure of Ships, F. K. Ruprecht. Int. Mar. Eng., vol. 25, nos. 6, 7 and 8, June, July and Aug. 1920, pp. 519-521, 603-606 and 652-656. June: Test schedule for cargo vessels; rules and methods for testing peak and ballast tanks and forward collision bulkhead. July: Rules and methods for testing tanks used for carrying fuel oil, fuel oil bunkers and settling tanks. Aug.: Rules and methods for testing chain lockers, shaft tunnels, decks and deck erections, cargo oil compartments and cofferdams.

Internal Bossing. Internal Bossing for Cargo Vessels, E. de Brinja. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 752-754, 2 figs. Structural changes proposed where strength and savings in space and cost are of vital importance.

Isherwood System. An Analysis of the Isherwood System, John Flodin. Int. Mar. Eng., vol. 25, nos. 2 and 3, Feb. and Mar. 1920, pp. 128-131 and 205-210, 15 figs. Feb.: Experience of shipbuilding company is referred to which changed from transverse to longitudinal system of construction. Design under consideration was: Length between perpendiculars, 380 ft.; length overall, 395 ft.; breadth, molded, 53 ft.; depth, molded, 29 ft. 3 in.; load draft, 23 ft. 6 in.; deadweight cargo capacity, 7500 tons. Mar.: It is concluded that Isherwood system of longitudinal framing offers important advantages and that disadvantages are relatively slight.

The Effect of the Isherwood System. Shipping, vol. 10, no. 10, Mar. 10, 1920, pp. 18

and 45. States that within twelve years nearly 1300 ships have been constructed or are now under construction on longitudinal system invented by Isherwood and that system has had revolutionizing effect on shipbuilding industry.

Joining Sections, New Method. New Method of Joining Ship Sections, James Nacy. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 115-116, 2 figs. Methods designed with object of eliminating use of dry dock in assembling several sections. Process is to render each section seaworthy unit by closing ends with special watertight bulkheads and to arrange pipe connections in each section so that usual trouble of pipe fitting after assembly is avoided.

Plating, Effects of Holes, Cracks, Etc. The Effects of Holes, Cracks and Other Discontinuities in Ships' Plating, E. G. Coker and A. L. Kimball, Jr. Eng., vol. 109, no. 2842, June 18, 1920, pp. 840-842, 17 figs. A crack is considered as limiting case of an ellipse in which minor axis is vanishingly small. It is stated that a crack inclined to direction of stress produces great concentration which approaches an infinite value. A practical way of reducing stress intensity, it is claimed, is to drill out ends of crack and experiments are described to show what effect this produces and also change in stress produced by forming elliptical cavities at ends instead of circular holes. Paper read before Instn. Naval Architects.

Pre-assembly Methods. Pre-assembly in Ship Construction, R. D. Gatewood. Am. Mach., vol. 52, nos. 1 and 4, Jan. 1 and 22, 1920, pp. 1-6, 12 figs., and 171-176, 8 figs. Describes and illustrates pre-assembly methods of building ships in 12-slip yard turning out an 880-ton ship every two weeks.

Production Methods. See INDUSTRIAL MANAGEMENT, Shipbuilding.

Standards for. Standards for Ship Construction, Creighton Churchill. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 198-205, 3 figs. Chart showing relative costs of 9000-deadweight-ton cargo vessel for different times of building, number of men being the same; also chart showing number of men per way (direct labor) at different man efficiencies and for different building programs.

Stern Frames. Castings Used in Ship Construction, Ben Shaw and James Edgar. Foundry Trade Jl., vol. 22, nos. 217, 218 and 220, Jan., Feb. and Apr. 1920, pp. 21-29, 119-125 and 289-296, 97 figs. Also in Foundry, vol. 48, nos. 1 and 2, Jan. 1 and 15, 1920, pp. 26-28 and 71-74, 29 figs. Methods of constructing sloped stern frame and of molding cast-steel stern frames in two-part built up flask. Type of stern frame used in single-screw ships.

See also MOLDING METHODS, Ship Work.

Welding. Electrically Welded Ships, William T. Bonner. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 330-339, 9 figs. Barge was constructed partly by welding and partly by riveting in order to compare construction and maintenance cost of two types. Results obtained are cited as proof of claim that electrically-welded jointures are cheaper than riveted work.

Permissible Ship Welding, William T. Bonner. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 348-350. Lloyd's list of parts which are permitted to be welded.

See also OXY-ACETYLENE WELDING, Ship Construction; WELDING, Ship Construction.

SHIP DESIGN

Booms. A Method for Determining Diameter of Booms, C. A. Vincent. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 180-182, 2 figs. Formula for determining thrust on boom is also presented.

Bottom, Shape of. Ship Resistance and the Ramus Principle, A. W. Johns. Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 395-397, 2 figs. Critical study of suggestions of Charles Meade Ramus to British Admiralty to adopt stepped inclined planes as shape of bottoms of ships with a view to increasing speed. Suggestion was made to admiralty in 1872 and has been since examined theoretically and experimentally.

Cargo Ships. Notes on Cargo Ship Economics, E. H. Rigg. Jl. Am. Soc. of Mar. Draftsmen, vol. 6, no. 4, Jan. 1920, pp. 59-65. Discusses selection of pipe and dimensioning ship to comply with given conditions of cargo transportation.

Systematic Experiments with Cargo-Ship Models (Systematische Versuche mit Handelsschiffsmodellen), H. Schaffran. Schiffbau, vol. 21, no. 19-20, Mar. 31-Apr. 7, 1920, pp. 561-567, 8 figs. Results of experiments are said to show that in the case of full-shaped freight steamers of given main dimensions with long parallel midships, with the elongation of the latter and with increase of displacement degree of fineness above a certain limit, a very sudden decrease in efficiency takes place, which is explained by fact that with increase of degree of fineness not only an increase of resistance takes place, but a considerable deterioration in propeller efficiency as well. Results are shown in diagrammatic curves.

Design Data. The Status of Ship Data, C. H. Peabody. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 797-799. Suggestions in regard to improving present methods used in displacement, stability, power and strength calculations.

Double Bottom. Importance of the Double Bottom for the Safety of a Leaky Ship (Die Bedeutung des Doppelbodens für die Sicherheit des lecken Schiffes), H. Wittmaack. Schiffbau, vol. 21, no. 38, Aug. 11, 1920, pp. 1031-1038, 3 figs. Points out that in interest of safety of ships when grounded, double bottom cells should not be entirely filled with oil or water, but only to extent of 80 to 85 per cent; and it is more advantageous if the fresh water, oil or ballast water is not taken in the cells lying under middle sections, but in the cells of the bow and stern, because, when springing a leak, due to the narrow width of these sections, the reduction of the metacentric height is slighter.

Electrical Installations. The Design of Electrical Installations for Ships, C. H. Wordingham. Elecn., vol. 85, no. 2207, Sept. 3, 1920, pp. 248-251. Advantages of ring system of conductors with sufficient control. In this system pair of conductors forming a ring is run round ship, passing through all principal compartments. Experience in British Navy with this system.

Freeboard and Strength. Freeboard and Strength of Ships, J. Bruhn. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 500-503, 1 fig. Examination of existing rules and practices of various countries regarding freeboard and strength of ships. Considerations towards establishment of international rules. Paper read before Instn. Naval Architects.

Hull Resistance. Note on Resistance of Hull. Influence of Trim of Ship (Note sur les résistances de caréne. Influence de l'assiette du navire), C. H. Holst. Bulletin Technique de Bureau Veritas, vol. 2, no. 8, Aug. 1920, pp. 157-161, 7 figs. Technical study. Graphs indicating normal resistances.

Hull Weights, Estimation of. Method of Estimating Steel Hull Weights, G. F. S. Mann. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 651-652. How curves from weight of ships already built may be expanded and curves plotted for various divisions of hull steel.

Keel, Shape of. Keel Shape of Least Resistance to Translation in Free Air at All Speeds (Formes de carènes de moindre résistance a leur translation à l'air libre, à toutes les vitesses), F. E. Fournier. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 10, Mar. 8, 1920, pp. 547-552. It is investigated by mathematical reasoning that shape of least resistance is tetrahedron having for "flotation plane," and for "flat bottom" inclined to this plane by 5 deg. 18 min. 30 sec., two isosceles triangles adjacent at the base, of the same breadth at the stern, and connected at their vertices to the two extremities of the vertical cutwater of the keel.

Metacenter Height. Relation of Beam to Height of Metacenter, F. M. Hiatt. Int. Mar. Eng., vol. 25, no. 7, July 1920, pp. 569-572, 8 figs., partly on 2 supp. plates. Curves for determining quickly height of metacenter above base, from any combination of dimensions and form coefficients.

Model Experiments. Systematic Experiments with Cargo Ship Models (Systematische Versuche mit Handelsschiffsmodellen), H. Schaffran. Schiffbau, vol. 20, no. 21, Aug. 13, 1919, pp. 583-587, and vol. 21, nos. 6 and 8, Dec. 24, 1919, and Jan. 14, 1920, pp. 206-220 and 276-288, 31 figs. Aug. 13: Effect of longitudinal position of parallel midship portion of single-screw steamers on necessary engine power and efficiency of propeller. Dec. 24: Influence of after-rib design on resistivity of a single-screw freight steamer, also on engine capacity and general propulsion efficiency. Jan. 14: Comparison of action of adjustable 4-bladed propeller with large hub and ordinary fixed-blade propeller of otherwise identical construction. Analysis of results of experiments based on diagrams of systematic propeller tests. Effect of adjusting these blades on propulsion of ship.

See also SHIPS, Resistance.

Passenger Vessels, Subdivision of. Subdivision of Passenger Vessels, George Webster. Shipbuilding and Shipping Rec., vol. 16, no. 3, July 15, 1920, pp. 78-84 and (discussion) 85, 6 figs. Consideration of variables affecting flooding calculations; floodable length and freeboard ratio, permeability, sheer ratio, and block coefficient. Paper read before Instn. of Naval Architects.

Resistance Formulæ. Analysis of Resistance of a Ship Based on Experiments with Models (Eine Zerlegung des Schiffswiderstandes auf Grund von Modellversuchen), Wilhelm Schmidt. Schiffbau, vol. 21, no. 5, Dec. 10, 1919, pp. 174-182, 11 figs. Formulæ and equations are presented and compared with former formulæ. Differences between these and the Froude tests are pointed out.

Rest Moment. The "Rest Moment" in Connection with Calculations of Longitudinal Strength (Das "Restmoment" bei Längsfestigkeitsrechnungen), H. Schultz. Schiffbau, vol. 21, no. 12, Feb. 11, 1920, pp. 391-396, 10 figs. It is pointed out that in computing strength for ships in wave crest and wave trough, if centers of buoyancy and of gravity do not lie in same vertical, a rest moment occurs which, it is claimed, can prove troublesome to conscientious calculators. Method is explained, by means of which it is said to be possible to calculate longitudinal strength without predetermination of center of gravity, whereby rest moment is equalized by correction curves.

SHIP MODELS

Experiments with. See SHIPS, Resistance of.

SHIP PROPELLERS

Balancing. See BALANCING, Turbines and Propellers.

SHIP PROPULSION

Airscrew. Propulsion of Barges by Air Propellers (L'hélice aérienne et le halaje des bateaux sur les voies navigables), M. Bousquet. Nature (Paris), no. 2420, Aug. 21, 1920, pp. 123-126, 2 figs. Arrangement with which speed of 2½ miles per hour has been obtained using 10-hp. engine operating six-bladed propeller.

Cargo Ships. The Propulsive Efficiency of Single-Screw Cargo Ships, Wm. McEntee. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 796-799, 6 figs. Effect of varying amount of parallel middle body and longitudinal coefficient simultaneously with constant over-all dimensions. Paper read before Soc. Naval Architects and Mar. Engrs.

Comparison of Systems. Sulzer Two-Cycle Engines and the Propulsion of Cargo Boats. Motorship, vol. 5, nos. 3 and 4, Mar. and April, 1920, pp. 209-212, 11 figs., and 316-321, 10 figs. Comparison with four-cycle Diesel engines, steam-reciprocating engines and steam turbines.

Diesel Engine. Application of Diesel Engines to the Propulsion of Ships (L'application du moteur Diesel à la propulsion des navires), J. Vallée. Technique Moderne, vol. 12, no. 8, Aug. 1920, pp. 321-323, 1 fig. Chart giving net tonnage of cargo-boat displacing total of 12,500 tons, for different systems of propulsion and for cruising radius varying from 0 to 80 days.

Diesel-Electric Drive. Converting the Ferris-Type Wooden Hulls Into Diesel-Electric Driven Motorships, Renwick Z. Dickie. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 166-169, 5 figs. How Winton Engine Works, Cleveland, Ohio, in collaboration with Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is manufacturing direct-connected stationary engines for this purpose which are light enough to allow main power plant of vessel to be placed on deck.

Efficiency. The Efficiency of Propulsion of Full-Sized Ships, C. Frodsham. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 193-196, 10 figs. Also in Shipbuilding and Shipping Rec., vol. 16, no. 4, July 22, 1920, pp. 121-125, 9 figs. It is contended that propulsive coefficient derived synthetically from model experiments is not realized in actual ship. Values of propeller efficiency, wake factor, or hull efficiency in model and actual ships are compared. Suggestions in design of ships are formulated from study of test data obtained in trials of various ships. Paper read before Instn. Naval Architects.

Electric. See SHIP PROPULSION, ELECTRIC.

Geared-Turbine. Development of Geared Turbines for the Propulsion of Ships, R. J. Walker. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 386-387, 1 fig. With table of comparative results obtained with Parsons single-reduction gear turbines and reciprocating engines. Paper read before Engineering Section of British Assn.

Geared Turbine Propelling Machinery of H. M.S. "Raleigh." Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 410 and 418-419, 6 figs. Machinery consists of four identical sets, two port and two starboard, each of three turbines of Brown-Curtis impulse type. Cruising turbine is connected by clutch direct to forward end of each high-pressure turbine, which is connected in turn by flexible coupling to high-pressure pinion of single-reduction double-helical gearing. Low-pressure turbine is similarly connected to its gearing. Other features of ship are also described and account of trials is given.

Hydraulic Propeller. Hydraulic Propulsion for Ships, D. V. Hotchkiss. Motorship, vol. 5, no.

8, Aug. 1920, p. 730. Failure of hydraulic propeller in past, author believes, has been due to simple faults and not to inherent fundamental misconceptions of the general problem of propulsion.

Steam-Turbine. Propelling Machinery of the Leviathan, Ernest H. B. Anderson. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 51-60, 19 figs. Attention is called to such features of machinery as arrangement which permits operation of two turbines on any one of four shafts entirely independent of other units. Vessel is driven by Parsons direct type of steam turbine. Paper read before Soc. of Naval Architects & Mar. Engrs.

Westinghouse Propelling and Auxiliary Machinery Installed in Fabricated Ships, P. M. Robinson. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 83-100, 35 figs. Machinery consisted of Westinghouse turbines of impulse-reaction, cross-compound type, consisting of high-pressure and low-pressure unit, each of which was connected to first reduction pinion through flexible shaft and coupling.

Superheated Steam in. Superheated Steam and Operating Costs, H. B. Oatley. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 138-140, 1 fig. Attention is called to rapid strides being made in England and on the Continent in utilization of superheated steam. Table is given showing methods of propulsion and degrees of superheat used by different ships.

Turbine. The Propelling Machinery of H.M.S. Hood. Marine Eng., vol. 10, no. 4, Apr. 1920, pp. 81-83, 4 figs. Brief description of turbine installation of battleship and illustrations, giving idea of size of the units.

Tyrrhenia. The New Cunarder "Tyrrhenia." Shipbuilding & Shipping Rec., vol. 15, no. 22, May 27, 1920, pp. 705-706. Dimensions: Overall length, 578 ft. 6 in.; breadth, 70 ft.; depth, 42 ft. 9 in.; tonnage, 17,000 tons gross. Details of electrohydraulic machinery and propelling machinery.

SHIP PROPULSION, ELECTRIC

Advantages. Electric Propulsion of Ships (La propulsion electrique des navires), Marcel de Coninck. Technique Moderne, vol. 12, no. 1, Jan. 1920, pp. 1-7, 2 figs. Advantages are enumerated and recent progress is pointed out.

Inter-Vessel Power Transmission. A New Development in the Application of Electricity to Marine Transportation, William T. Donnelly. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 352-359, 8 figs. Tests are said to have proved practicability of generating electrical power on one vessel and transmitting it to another for propulsion and other uses.

Merchant Ships. Electric Propulsion of Merchant Ships, W. L. R. Emmet. Pac. Mar. Rev., vol. 17, no. 1, Jan. 1920, pp. 78-82, 7 figs., partly on supp. plate. Also in Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 814-817, 5 figs. Comparative study of costs of installing and operating merchant ships by electricity and steam. Paper read before Soc. of Naval Architects & Mar. Engrs.

Progress in. The Electrification of Ships, Wm. P. Durtnall. Trans. Inst. Mar. Engrs., vol. 31, July 1920, pp. 661-700, 14 figs. Progress made since 1910. Paper read at Int. Shipping, Eng. & Machy. Exhibition, Olympia, Kensington, Lond.

S. S. Wulsty Castle. Electric Propulsion on the Steamship Wulsty Castle, George B. Pulham. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 45-51, 10 figs. Ship is driven by Ljungstrom turbo-alternators.

Systems. Systems of Electric Ship Propulsion (Les divers systèmes de propulsion électrique des navires). Industrie Électrique, vol. 29, nos. 671 and 673, June 10 and July 10, 1920, pp. 206-215 and 246-251, 14 figs. June 10: Survey of past developments and visualization of future progress. July 10: Induction motors coupled in cascade; operated by multi-phase currents.

U. S. S. New Mexico. Systems of Electric Propulsion of Ships (Les divers systèmes de propulsion électrique des navires). Industrie Électrique, vol. 29, no. 672, June 25, 1920, pp. 224-230, 14 figs. Installation on board U. S. S. New Mexico.

U. S. S. Tennessee. Electric Propelling Machinery of the U. S. S. Tennessee, William H. Easton. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1118-1119, 3 figs. Maximum power will be 33,500 hp. and maximum speed is expected to be over 21 knots.

Electric Propelling Machinery for U. S. S. Tennessee, Wilfred Sykes. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 52-54, 3 figs. Propelling machinery consists of two turbo-alternators and four propelling motors.

Various Systems. The Various Systems of Electric Propulsion of Ships (I diversi sistemi di propulsione elettrica delle navi), Francesco Modugno. Rivista Marittima, vol. 52, no. 11, Nov. 1919, pp. 169-198, 12 figs. Survey of systems employed in actual practice and discussion of possibilities of induction motors connected in cascade and other schemes for electric propulsion.

SHIP SALVAGE

Reinforced-Concrete Floats for. Christiani-Nielsen Reinforced-Concrete Floats for Salvaging Ships (Flotteurs en béton armé, système Christiani et Nielsen, pour le renflouage des navires). Génie Civil, vol. 76, no. 8, Feb. 21, 1920, pp. 211-212, 8 figs. Each float is a cylinder 68 ft. long and 11 ft. in diameter. It is divided into six compartments and emptying is accomplished by compressed air.

SHIPBUILDING

American Shipyards. Shipbuilding in American Shipyards. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 846-848. Steel vessels under construction for private account. Total construction of merchant tonnage.

Australia. See SHIPS, Cargo.

Bonus System. See BONUS SYSTEMS, Shipbuilding.

Germany. Development of German Shipbuilding with Special Consideration of Cargo-Ship Construction (Die Entwickelung des deutschen Schiffbau unter besonderer Berücksichtigung des Frachtdampferbaues), H. Dressel. Schiffbau, vol. 21, nos. 33, 34, 35, 37 and 38, July 7, 14, 21, Aug. 4 and 11, 1920, pp. 897-902, 931-934, 958-962, 1007-1012 and 1038-1042. Investigation of the economic causes for the English superiority in shipbuilding up to period of war and the American development during war, which are then considered from standpoint of their application to German shipbuilding, and ways and means for a more favorable development of German cargo-steamer construction are suggested.

Laying Off. Simplified Shipyard Technique. Shipbuilding and Shipping Rec., vol. 15, no. 5, Jan. 29, 1920, pp. 139-141, 5 figs. Suggests developments of laying off for speeding up of ship construction.

Production Methods. See INDUSTRIAL MANAGEMENT, Production Systems; Shipbuilding.

Research. Scientific Research in Connection with Marine Engineering and Shipbuilding, Frank Heath. Trans. North-East Coast Instn. of Engrs. & Shipbuilders, vol. 35, no. 2, Mar. 1919, pp. 69-81 and (discussion) 81-85. Pos-

sible fields for investigation are indicated and reasons are given to prove that organization of research should be in hands of government.

SHIPPING

American. See MERCHANT MARINE, American.

Merchant Marine Act. The Shipping Bill, J. W. Powell. Jl. Engrs. Club of Phila., vol. 37-10, no. 190, Oct. 1920, pp. 387-391. Review of situation of American merchant marine, before, during and after the war. Merchant Marine Act is outlined, and probable effect of this legislation upon future of American Merchant Fleet is pointed out.

[See also MERCHANT MARINE.]

SHIPS

American. 502-Foot Passenger and Cargo Vessels. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 265-269, 10 figs. Shipping Board steamers for overseas service built at plant of New York Shipbuilding Corporation, Camden, N. J. Dimensions are: Length overall, 522 ft. 5 in.; length between perpendiculars, 502 ft.; beam, molded, 62 ft.; draft, summer, 31 ft. 9 in.; gross tonnage, 10,500; service speed, 14 knots; i.hp., 6000. Propulsion is by twin screws driven by two sets of four-cylinder, triple expansion, vertical, inverted reciprocating engines.

New American Passenger Steamers. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 260-264, 10 figs. Vessels being built for U. S. Shipping Board. Particulars are: Length overall, 535 ft.; length between perpendiculars, 534 ft.; beam, molded, 72 ft.; depth, molded, 50 ft.; draft, summer, 30 ft. 6 in.; gross tonnage, 13,500; service speed, 17½ knots; steaming radius, 11,700 miles. Propulsion is by twin screws driven by two sets of double reduction geared turbines of Westinghouse double-flow type.

Auxiliaries. See SHIP AUXILIARIES.

British. British Standard Ship of 3,150 Tons D. W., Frederick C. Coleman. Int. Mar. Eng., vol. 25, no. 4, April 1920, pp. 275-276 and p. 380, 6 figs., partly on supp. plate. Cargo ships of standard design being developed by shipbuilders in Great Britain to replace war losses in vessel tonnage. Dimensions: Length overall, 275 ft.; length between perpendiculars, 265 ft.; breadth amidships, 41 ft.; extreme draft, 20 ft. 2 in. Propelling machinery consists of set of triple-expansion, inverted, direct-acting, surface-condensing engines.

T.S.S. Lawrence for the Royal Indian Marine. Eng., vol. 109, no. 2821, Jan. 23, 1920, pp. 115-116 and p. 118, 10 figs., partly on supp. plate. Dimensions: Length between perpendiculars, 225 ft.; breadth molded, 34 ft.; depth molded to upper deck amidships, 20 ft.; gross tonnage, 1100. Propulsion is by twin screws driven by geared turbines supplied with steam from oil-fired water-tube boilers.

Cargo. A 6000-Ton Deadweight Cargo Steamer. Shipbuilder, vol. 22, no. 113, Jan. 1920. pp. 13-16, 1 fig. Specifications: Length between perpendiculars, 331 ft.; breadth, molded, 48 ft. 6 in.; depth molded, 27 ft. 3 in.; load draft, 22 ft.

American Standard 8800 Ton D.W. Cargo Steamships. Shipbuilding and Shipping Rev., vol. 14, no. 19, Nov. 6, 1919, pp. 517-521, 7 figs., partly on supp. plate. Built by Newburgh Shipyards, Inc., Newburgh, N. Y., for U. S. Shipping Board. Principal dimensions are: Length overall, 417 ft. 10 in.; breadth moulded, 54 ft.; depth moulded to upper deck, 32 ft. 10 in.; draught, Lloyd's summer freeboard, 25 ft. 6 in.

Cargo Steamer of 4,750 Tons D. W. on 21 ft. 8 in. Draft. Shipbuilding & Shipping Rec., vol. 16, no. 11, Sept. 9, 1920, pp. 315-317, 7 figs. Dimensions: Length between perpendiculars, 324 ft.; breadth, molded, 44 ft.; depth, molded, 25 ft. 6 in.; deadweight, 4750 tons. Propelling machinery consists of single set of triple-expansion engines having cylinders 20½ in., 33 in., and 54 in. diameter and 39 in. stroke, steam being supplied by two cylindrical boilers of usual marine type.

Economical Cargo Ships, Alfred J. C. Robertson. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 799-805, 3 figs. Cost of operation at four different speeds of four standard vessels of different sizes. Paper read before Soc. Naval Architects and Mar. Engrs.

Notes on the Dimensions of Cargo Steamers, John Anderson. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 496-499, 4 figs. Discusses best proportions of depth and breadth for lengths obtained under different conditions of loading and length of voyage. Paper read before Instn. Naval Architects.

Steamship Eudunda Launched at Australian Naval Dockyard. Int. Mar. Eng., vol. 25, no. 7, July 1920, pp. 550-552, 3 figs. Dimensions: Length, between perpendiculars, 331 ft.; breadth, molded, 47 ft. 9 in.; depth, molded to upper deck, 26 ft. 1 in.; deadweight capacity, 6000 tons.

10,500-Ton Deadweight Cargo Carrier. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 714-716, 3 figs., partly on supp. plate. Type of vessel under construction for Shawmut Steamship Company at Chester Yard of Merchant Shipbuilding Corporation. Characteristics: Length overall, 457 ft.; beam, molded, 57 ft.; depth at side to shelter deck, 39 ft.; draft, designed load, 28 ft. 9 in.; displacement at designed load draft, 15,000 tons; speed on designed load draft, 13 knots.

The Economic Efficiency of Merchant Ships, Alexander Urwin. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 35, part 3, May 1919, pp. 86-96 and (discussion) pp. 96-108, 2 figs., partly on supp. plate. Proposes scheme whereby efficiency of merchant ship can be measured and contribution to final efficiency of each factor shown in such manner as to give definite figure to its importance and indicate its value relative to other items.

The P. and O. Liner "Naldera." Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 278-279, 10 figs., partly on supp. plate. Dimensions: Overall length, 605 ft.; width, molded, 67 ft.; depth, molded, 90 ft. 9 in.; gross tonnage, 15,825; draft, 29 ft. 6¾ in.; bunker capacity, 2940 tons.

War Experience with Merchant Ships, J. J. Welch. Eng., vol. 110, no. 2845, July 9, 1920, pp. 37-41, 2 figs. Some features in design and construction of mercantile vessels considered in light of recent war experience. Comments on answers received to questionnaire sent out by Board of Trade to elicit information relating to the circumstances attending mining or torpedoing of mercantile vessels. Paper read before Instn. Naval Architects.

Cargo, Machinery for. Installing Machinery and Operation of 7825 D. W. T. Cargo Carriers, C. S. Bookwalter. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June 1920, pp. 241-245, 4 figs. Operations required for properly lining turbines and reduction gears and shafting.

Cargo Motorships vs. Steamships. Cargo Motorships vs. Steamships, Charles E. Lucke. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 759-763. Comparative calculations of expenses and earnings for operation of steam and motor ships.

Coal Carrier. Collier of 1300 Tons D.W. on 13

ft. 9 in. Draught. Shipbuilding & Shipping Rec., vol. 16, no. 6, Aug. 5, 1920, pp. 176-179, 5 figs. Dimensions: Length between perpendiculars, 217 ft.; breadth, 32 ft.; depth moulded, 15 ft. 6 in.; capacity of holds, 61,000 cu. ft.; bunker capacity, 80 tons. Built by S. P. Austin & Son, Ltd., Sunderland.

Coal, Loading with. See COAL HANDLING, Ship Loading.

Coaling. See COAL HANDLING, Coaling Ships.

Coasting Steamers. A Standard Coasting Steamer. Shipbuilder, vol. 22, no. 115, Mar. 1920, pp. 185-188, 4 figs. Specifications: Length b.p., 178 ft.; breadth mld., 28 ft. 8 in.; depth mld. to main deck, 13 ft. 3 in.; deadweight load, 870 tons. Propelling machinery consists of set of triple-expansion reciprocating engines having cylinders 14, 23 and 39 in. diameter by 27 in. stroke. Designed for coal, wood or general cargo trade.

Commonwealth-Dominion Liners. New Commonwealth-Dominion Liners. Shipbuilding and Shipping Rec., vol. 16, no. 4, July 22, 1920, pp. 118-120, 7 figs., 5 on supp. plates. Description of "Port Adelaide," built for Commonwealth & Dominion Line, Ltd., The Cunard Line, Australasian Service.

Concrete. See SHIPS, CONCRETE.

Construction. See SHIP CONSTRUCTION; SHIPBUILDING.

Converted Warships. From Warships to Cargo Steamers. Shipbuilding & Shipping Rec., vol. 15, no. 9, Feb. 26, 1920, pp. 266-270, 5 figs. Designs of 500 tons d.w., 2000 tons d.w. and 4300 tons d.w. being built by John I. Thornycroft & Co., Ltd., Southampton, Eng.

Dazzle Painting of. The Dazzle Painting of Ships, Norman Wilkinson. Jl. Royal Soc. of Arts, vol. 68, no. 3512, Mar. 12, 1920, pp. 264-272. Reasons for this adoption as opposed to painting a ship with a view to achieving invisibility.

Design. See SHIP DESIGN.

Detachable-Power-Plant Type. Constan Type of Ship With Detachable Power Plant (Navires a "pousseurs," système Constan). Génie Civil, vol. 76, no. 6, Feb. 7, 1920, pp. 152-154, 13 figs., part on supplement plate. Power plant is carried on special hull, wedge-shaped in front, which is fastened rigidly at edge of wedge to edge of diehedral angle in stern of cargo hull.

Electrical Equipment. Electrical Equipment of Modern Express Steamers (Die elektrischen Einrichtungen neuzeitlicher Schnelldampfer), H. Stauch. Elektrotechnische Zeitschrift, vol. 40, no. 40, Oct. 2, 1919, pp. 497-498. Information abstracted from bulletin issued by Society of German Engrs., giving detailed description of steamship "Vaterland" (Leviathan).

The Development of Electrical Installation Aboard Ships, F. A. Anderson. Jl. Electricity, vol. 44, no. 3, Feb. 1, 1920, pp. 111-112. Types of equipment most suitable for marine use.

50-Ft. Steamers, Trials. Trials of New Fifty-Foot Steamers Equipped with Turbine and Reduction Gear, William C. Owen. Jl. Am. Soc. Naval Engrs., vol. 32, no. 2, May 1920, pp. 311-325, 3 figs. Specifications of steamers: Length overall, 50 ft.; beam, 9 ft. 10¾ in.; weight, 44,700 lb.; draft to bottom of keel, 3 ft. 8 in.; fuel-oil capacity, 300 gal.

Fruit Steamers. Fruit Steamers Hibueras and Nicarao, Charles Feldman. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 799-803 and 821, 7 figs., partly on supp. plate. Combined fruit and passenger vessels built by Standard Shipbuilding Corporation for service in Honduran fruit trade. Dimensions: Length, between perpendiculars, 235 ft.; beam, molded, 34 ft.; depth to shelter deck, 23 ft. 6 in.; sea speed at load draft of 15 ft. 8 in., 11 knots.

Funnels, Air Pressure About. The Distribution of Air Pressure and Wind Velocity About the Funnel of a Vessel at Sea, A. P. Thurston. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 134-135, 4 figs. Results of experiments.

Guiding by Acoustic Signals. Acoustic Aids to Navigation, C. S. McDowell. U. S. Naval Inst. Proc., vol. 46, no. 204, Feb. 1920, pp. 231-236, 2 figs. Method of obtaining bearings by means of acoustical detectors of safety signals sent out from lighthouse.

Guiding by Electric Signals. An Electrical Signaling Method for Guiding Ships, R. H. Marriott. Jl. Electricity, vol. 44, no. 3, Feb. 1, 1920, pp. 113-115, 4 figs. Method proposed consists in installing signal-carrying conductor along the sides of channel or under channel and picking up signals on vessel.

Gunboats, Conversion to Cargo. The Conversion of Gunboats to Cargo Vessels. Eng., vol. 110, no. 2845, July 9, 1920, pp. 46-47 and p. 50, 8 figs. Conversion involved lengthening hull from 170 ft. to 213 ft. Deadweight capacity of converted ship about 1000 tons.

Ice Breakers. Ice-Breakers, John Flodin. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 707-712, 5 figs. Characteristics of vessels designed expressly as ice breakers. American and European practice. Work in pack ice.

Launching. See SHIPYARDS, Launching.

Lifeboats. See LIFEBOATS.

Liners. New Cunard Liner "Scythia." Shipbuilding & Shipping Rec., vol. 15, no. 14, Apr. 1, 1920, pp. 425-426, 5 figs. Specifications: Extreme length, 625 ft.; extreme breadth, 74 ft.; depth from keel to top of funnel, 140 ft.; draught, 30 ft.; displacement, 27,000 tons; average speed, 16 knots. Among special features are said to be abolition of steam and exhaust pipes.

See also SHIP PROPULSION, Tyrrhenia.

Machinery Design. Designing Marine Machinery for Economy, H. C. Dinger. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 743-744. Features of machinery design that affect fuel consumption of ship. Reduction and simplification of piping. Furnace and condenser losses.

Models, Experiments with. See Resistance; SHIP DESIGN, Model Experiments.

Motorships. See MOTORSHIPS.

Navigation. See Guiding by Electric Signals; RADIO COMMUNICATION, Guiding Aerial and Marine Craft.

Non-Rolling. See Stabilized.

Oil-Burning Installations. Oil Burning Installation of the Aquitania. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 817-821, 4 figs. General details of oil storage pumping arrangements and structural changes which were necessary to convert installation to oil burning. Increased speed is said to have resulted from transformation.

Passenger. Geared Turbine Passenger Steamer Antwerp, Frederick C. Coleman. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 625-630, 11 figs., 2 on supp. plates. First of three new steamships for Harwich-Antwerp service of Great Eastern Ry. of England.

Subdivision of Passenger Vessels, George Webster. Eng., vol. 110, no. 2846, July 16, 1920, pp. 94-98, 6 figs. Simplification of method for obtaining flooding curve for ship, proposed by Bulkhead Committee and adopted by British Board of Trade. Paper read before Instn. Naval Architects.

The New Liners of the P. & O. Fleet. Shipbuilding and Shipping Rec., vol. 16, no. 1,

July 1, 1920, pp. 17-20, 2 figs. Elimination of inside berths and changes in accommodation of "M" boats among new features of liners.

T. SS. "Versailles." Shipbuilding & Shipping Rec., vol. 16, no. 10, Sept. 2, 1920, pp. 285-286, 4 figs. Geared-turbine steamer for Newhaven-Dieppe service, built by Société Anonyme des Forges et Chantiers de la Méditerranée. Dimensions: Length between perpendiculars, 303 ft.; breadth, extreme, 36 ft. 1 in.; depth of promenade deck, 23 ft. 4 in.; load draft, 9 ft. 6 in.; displacement, 1596 tons. Bilge-Pumping Arrangements in Passenger Steamships, D. Hipwood. Steamship, vol. 32, no. 376, Oct. 1920, pp. 85-86. Instructions, based on recommendations of Bulkheads Committee, issued by British Board of Trade under provisions of Merchant Shipping Acts for assistance and guidance of their officers in surveying passenger steamships.

See also Liners.

Power Requirements. Power and Speed of Steamers, Arthur R. Liddell. Engineer, vol. 128, no. 3331, Oct. 31, 1919, pp. 430-431. Methods for calculating power required to overcome different resistances experienced by ship.

Prevention from Sinking. Aids to Prevent a Ship from Sinking, Charles V. A. Eley. Trans. Inst. Mar. Engrs., vol. 29, no. 233, Mar. 1918, pp. 383-406 and (discussion) pp. 406-461, 9 figs. Three systems are discussed: (1) Air pressure system; (2) "Brunton" system, which consists in diverting main circulating discharge water into end of vessel opposite to that in which damage takes place "thus giving the greatest moment and creating a head of water of any extent necessary;" and (3) "Eley" system, which deals with direct pumping combined with central means of indicating position and amount of damage, central means for operating pumps and for leveling water in ship for keeping level keel.

Propellers. See PROPELLERS, SHIP.

Propulsion of. See SHIP PROPULSION; SHIP PROPULSION, ELECTRIC.

Reconditioning of. The Reconditioned Cunarder "Aquitania." Shipbuilding and Shipping Rec., vol. 15, no. 26, June 24, 1920, pp. 833-836, 17 illus., 11 on supp. plate. Describes oil-fuel installation, reconstruction of bunkers, pumping and piping arrangements, storage and settling tanks, advantages of oil fuel and other structural alterations.

Resistance. Experiments on Full Cargo-Ship Models. Shipbuilding & Shipping Rec., vol. 14, no. 17, Oct. 23, 1919, pp. 465-467, 3 figs. Comparison of various models.

Systematic Experiments with Cargo Ship Models (Systematische Versuche mit Handelsschiffsmodellen), H. Schaffran. Schiffbau, vol. 20, no. 21, Aug. 13, 1919, pp. 583-587, and vol. 21, nos. 6, 8, 15 and 16, Dec. 24, 1919, Jan. 14, Mar. 3 and 10, 1920, pp. 206-220, 276-288, 470-477 and 495-501, 49 figs. Influence of after-rib design on resistivity of a single-screw freight steamer, as well as on engine capacity and general propulsion efficiency. Comparison of action of adjustable 4-bladed propeller with large hub and the ordinary fixed-blade propeller of otherwise identical construction. Analysis of results of experiments based on diagrams of systematic propeller tests. Effect of adjusting these blades on propulsion of ship. Determination of dependence of resistance ratios of vessels of same displacement on length-breadth under different depth-breadth ratios.

The Starting of a Ship, James K. Whittemore. Proc. Nat. Acad. of Sciences, vol. 6, no. 4, April 1920, pp. 182-185. Formula expressing resistance of water to motion of ship.

Rolling of. Experiments on the Rolling of Ships, Kyoji Suyehiro and Mishio Ishimoto. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 2, Nov. 25, 1919, pp. 39-51, 9 figs. partly on 6 supp. plates. It was determined that anti-rolling tank may be used advantageously only when period of tank is less than that of ship. It is accordingly concluded that period of tank must be made shorter than probable shortest period of ship.

Rudders. See RUDDERS.

Safety at Sea. Safety of Life at Sea, Westcott Abell. Eng., vol. 110, no. 2846, July 16, 1920, pp. 91-93, 3 figs. View is expressed that factorial system of subdivision is incorrect in principle, and very small changes in size of vessel may give rise to large increases in risk of loss. It is suggested that scheme of subdivision more in accord with history consisting of combinations of "one" and "two" compartment standards can be arranged (1) to give rational system and graduated increase of safety with increase of length, (2) to give better standard of safety than is contained in present regulations, (3) to be capable of adjustment for variation in numbers of passengers carried, and (4) to meet reasonably economic requirements of cargo transportation. Paper read before Instn. Naval Architects.

Schooners. See SCHOONERS.

Shipyards. See SHIPYARDS.

Smoke Elimination. Apparatus for Eliminating Smoke from Steamships (Apparecchio per la eliminazione del fumo nelle navi). Industria, vol. 34, no. 13, July 15, 1920, pp. 339-340, 6 figs. Arrangement consists in utilization of circulating water of condensers for lowering temperature of smoke from boilers and clearing it of all matter in suspension.

Stabilized. Non-Rolling Passenger Liners, Elmer A. Sperry. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 43-47, 9 figs. Also Nautical Gaz., vol. 57, no. 13, Dec. 27, 1919, pp. 462-464, 2 figs.; and Pac. Mar. Rev., vol. 17, no. 1, Jan. 1920, pp. 73-77, 3 figs. Observations on large stabilized ship in service, including plant and economies effected by employment of gyro-stabilizer. Paper read before Soc. of Naval Architects & Mar. Engrs.

"Shape Stability" of Ships ("Formstabile Schiffskörper"), Ernst Foerster. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 29, July 19, 1919, pp. 669-676, 24 figs. Tests were made on ships plying between Lisbon and Rio de Janeiro, having speed of 15 knots. Stability losses between points of departure and port of arrival are calculated. Effect of stabilizing additions to body of ship.

The Stabilization of Ships by Means of Gyroscopes, P. R. Jackson. Eng., vol. 109, no. 2831, Apr. 2, 1920, pp. 462-464, 8 figs. Also in Shipbuilding & Shipping Rec., vol. 15, no. 14, Apr. 1, 1920, pp. 440-441, 3 figs. Principles of stabilizing by gyroscope system with mechanical details of its application to ships. Paper read before Instn. Naval Architects.

Steamships. SS. "Oropesa." Shipbuilding & Shipping Rec., vol. 14, no. 24, Dec. 11, 1919, pp. 675-677, 2 figs. Principal dimensions are: Length, 552 ft.; breadth molded, 66 ft.; depth molded to shelter deck, 45 ft.; gross tonnage, 14,500 tons; speed, 14½ knots.

The Anchor Liner "Cameronia." Shipbuilding & Shipping Rec., vol. 15, no. 1, Jan. 1, 1920, pp. 7-8 and 10-11, 4 figs. Principal dimensions are: Length between perpendiculars, 550 ft.; breadth, molded, 70 ft.; depth, molded, 42 ft. 9 in.; gross tonnage, 16,500.

Steel, American. Steel Ships Under Construction in American Shipyards for Private Account. Int. Mar. Eng., vol. 25, no. 7, July 1920, pp.

596-597. List is given containing total of 296 ships aggregating 1,404,698 gross tons.

Tank Steamers. See TANK STEAMERS.

Troop Transports. Buoyancy and Stabability of Troop Transports, William Hovgaard. Int. Mar. Eng., vol. 25, nos. 1 and 2, Jan. and Feb. 1920, pp. 60-64 and 132-137, 5 figs. Outlines precautions carried out in transports operated by U. S. Navy in accordance with general orders issued by Bur. of Construction and Repair. Various conditions of loading are discussed and reference made to instances of loss of stability by bilging. Paper read before Soc. of Naval Architects and Mar. Engrs.

Troopships Completed at Hog Island. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 737-740, 4 figs. Description of 6,000-hp., General Electric geared turbine installations on vessels to be used in Philippine trade. Dimensions: Length between perpendiculars, 448 ft.; beam, 58 ft.; draft, loaded, 28 ft. ¾ in.; speed, 15 knots.

Tugs. See TUGS.

Ventilation. Employing the Nozzle Effect for the Ventilation of Ships (Die Ausnützung der Düsenwirkung für die Lüftung auf Schiffen), Freudenthal. Schiffbau, vol. 20, no. 20, July 23, 1919, pp. 551-560, 26 figs. Sanitary significance of enlarged nozzle. Increasing nozzle effect by means of suction nozzle.

Ship Ventilation, F. R. Still. Jl. of Am. Soc. of Heat. & Vent. Engrs., vol. 26, no. 3, Apr. 1920, pp. 363-376, 13 figs. Survey of practices of typical ships of various classes.

Ventilating Systems, G. A. Bisset. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 720-724, 3 figs. partly on supp. plate. Graphic method of determining sizes of mains and ducts for mechanical ventilation. Calculations are based on General Specifications of U. S. Navy using coefficient of friction for ordinary piping of 0.0001.

Warships. See WARSHIPS.

Welded. The Development of Welded Ships, William T. Bonner. Jl. Engrs.' Club of Philadelphia, vol. 37-7, no. 187, July 1920, pp. 275-279, 8 figs. Author concludes that properly designed welded ships are lighter, stronger, less expensive, and more efficient than those of the present riveted type. Following description of various methods of welding and statement of present attitude of Lloyd's and other classification societies toward allowing welding on ships, suggestions are offered for guidance of designing engineers in elimination of needless materials and use of short cuts in construction and erection work. Delivered before Delaware River section of Am. Soc. Mar. Draftsmen.

Wooden. See SHIPS, WOODEN.

SHIPS, CONCRETE

Advantages. The Question of Concrete Ships (La question des navires en béton armé), R. Tardieu. Revue de l'Ingenieur et Index technique, vol. 27, no. 1, July 1920, pp. 25-40, 7 figs. Urges construction of concrete ships in France. Arguments are presented in proof of reliability and advantages of such ships.

Barges. See BARGES, Concrete.

Cost. Reinforced Concrete Ships, Barges, and Pontoons, Alfred B. Searle. Concrete, vol. 15, no. 7, July 1920, pp. 492-493. Relative costs of concrete vessels.

Design. Add Interior Braces and Stirrups to Concrete Tankers. Eng. News-Rec., vol. 84, no. 15, April 8, 1920, pp. 705-708, 5 figs. Structural weaknesses discovered led to changes in framing of 7,500-ton concrete oil tankers under construction by U. S. Shipping Board. Corrections consist in adding more shear steel in outer main frames and placing additional interior bracing in order to make possible docking of ships on center keelson.

Hollow-Tile Construction. New Methods for the Construction of Reinforced-Concrete Ships (Neue Wege beim Bau von Eisenbetonschiffen), Martin Mertes. Beton u. Eisen, vol. 19, nos. 6 and 9-10, Apr. 8 and June 5, 1920, pp. 64-66 and 112-113, 9 figs. Suggests new method which differs from usual one mainly in that the walls and floor of ship are built of hollow tiles made from light concrete about 26 in. long and 13 in. wide.

Oil Tanker. Concrete Tanker Built of Separately Cast Cylinders. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 388-393, 17 figs. Sections of two interlocked cylinders poured upright on platform and turned horizontally to be joined together to make 2000-ton oil carrying self-propelled vessel.

Repairing. Repair Holes in a Concrete Ship with Cement Gun. Eng. News-Rec., vol. 84, no. 23, June 3, 1920, p. 1113, 1 fig. Describes how patches were readily and successfully placed over holes punched in hull of Government concrete freighter.

Swedish. Sweden's First Wood and Reinforced-Concrete Ship (Das erste Holz-Eisenbetonschiff Schwedens), K. W. Ljungdell. Beton u. Eisen, vol. 18, no. 12 and 13, Aug. 4, 1919, pp. 132-136, 17 figs. It has displacement of about 1000 tons and carrying capacity of 700 tons. Length over all is 42 m.; draft, unloaded, 2.05, loaded 4 m.; and makes eight knots when loaded.

Tests. The Strainagraph and Its Application to Concrete Ships, Franklin R. McMillan. Int. Mar. Eng., vol. 25, no. 7, July 1920, pp. 588-593, 14 figs. Records obtained of water pressure and resultant stresses in structure of vessel by use of pressure gages and strainagraphs.

SHIPS, WOODEN

Boilers for. See BOILERS, WATER-TUBE, E. F. C. Marine.

SHIPYARDS

Armstrong. See England.

Cranes for. See CRANES, Shipyard.

Electric Drive for Machinery. Electric Motors for Shipyard Machinery, William Harrison, James Goldsborough and William H. Easton. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 469-475, 11 figs. Circumstances governing choice of motor are discussed and comparative advantages of individual and group drive are pointed out.

England. The Armstrong Shipyard. Eng., vol. 109, nos. 2829, 2831, 2832, 2834, 2836 and 2838, Mar. 19, Apr. 2, 9, 23, May 7 and 21, 1920 pp. 366-370, 434-437, 469-472, 540-543, partly on four supp. plates, pp. 601-603, 695-698, 85 figs., partly on supp plates. Description of 1000-ft. shipbuilding berth. Details of reinforced-concrete portion of jetty between two largest building berths. Jetty is 350 ft. long and 30 ft. wide at deck level. Details of reinforced-concrete structures designed on Hennebique system. Plan and details of platers' shed. Details of anglesmiths' shop and power station.

The Birkenhead Works of Messrs. Cammell Laird & Co., Limited. Eng., vol. 109, no. 2842, June 18, 1920, pp. 812-819, 19 figs., partly on 4 supp. plates. Description of Birkenhead shipyard and engine works.

The New Furness Shipbuilding Yard at Haverton Hill-on-Tees. Shipbuilder, vol. 22, no. 118, June 1920, pp. 421-437, 14 figs. Total area of shipyard is about 85 acres and total

river frontage about 2500 ft. All machinery throughout yard is driven by electrical power.

Furness. See England.

Halifax, N. S. Halifax Shipyard Has Reached Launching Stage. Mar. Eng. and Can. Merchant Service Guild Rev., vol. 10, no. 6, June 1920, pp. 135-138, 6 figs. Docking facilities. Details of buildings and equipment.

Launching. Motion Study of Side Launching of 6000-Ton Vessel. Eng. News-Rec., vol. 84, no. 10, Mar. 4, 1920, pp. 470-471, 2 figs. Instrumental observations of behavior of 6000-ton vessel during side launching conducted by research engineers of Emergency Fleet Corporation. Determined values of velocity, acceleration and friction of hull are plotted against time as well as against distance.

Side Launching Ways at the Saatse Shipyard for the Kaiser-Wilhelm Canal (Querhellinganlage auf der Werft Saatse bei Rendsburg für den Kaiser-Wilhelm-Kanal), H. Gillitzer. Zentralblatt der Beauverwaltung, vol. 39, no. 91, Nov. 8, 1919, pp. 541-544, 4 figs. Details of design and construction of launching way with description of the launching tables of 100-ton capacity and the twelve winches each of 22 tons tractive force.

The Strength of the Forward Cradle in Launching Ships. Shipbuilding & Shipping Rec., vol. 16, no. 12, Sept. 16, 1920, pp. 345-347, 7 figs. Graphical method of determining length on which load on forward cradle acts, and the distribution of load.

New Orleans. Great Shipbuilding Plant and Drydock in New Orleans. Manufacturers Rec., vol. 76, no. 19, Nov. 6, 1919, pp. 182-183, 4 figs. Notes on equipment. Plant is able to do any work on the ship and lift vessels up to 11,000 tons. It was constructed at cost of $2,000,000.

Organization in. See INDUSTRIAL MANAGEMENT, Shipyards.

Power Plants. See STEAM POWER PLANTS, Shipyards.

Side Launching. See Launching.

Slipway Haulage Machinery. 800-Ton Electric Slipway Machinery at Southampton. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 246 and 255, 7 figs. Slipway haulage machinery for raising vessels out of water. Single-drum design driven by reversible continuous-current motor. Cradle which travels up and down slipway is made in four positions coupled together, each portion having an independent sheave block.

World's Largest. The Largest Shipyard in the World. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 239-259, 44 figs. Expansion in 1918 to 1919 of plant of New York Shipbuilding Corporation at Camden, N. J. Tonnage delivered during war, 1915 to 1918, was 240,000 gross tons. Up to end of 1919 yard had launched 228 vessels aggregating 772,518 gross tons and 1,272,500 hp. Yard has at present 28 building ways, 9 piers and 18,000 employees.

[See also INDUSTRIAL MANAGEMENT, Shipbuilding.]

SHOP COMMITTEES

See EMPLOYEES' REPRESENTATION, Shop Committees; INDUSTRIAL RELATIONS, Shop Committees.

SHOPS

See FACTORIES.

SHOVELS

Electric. Operating Data on Large Electric Shovels at Queenstown Development, L. C. M'Lure. Eng. & Contracting, vol. 53, no. 20, May 19, 1920, p. 575, 2 figs. Chart showing energy consumption of electric shovel under actual working conditions.

See also COAL HANDLING, Electric Shovel.

SHRINK RINGS

Use. Shrink Rings (Die Schrumpfringe), P. Stephan. Dingler's polytechnisches Jl., vol. 334, no. 18, Sept. 6, pp. 187-200, 6 figs. Deals with fastening together of split machine parts with shrink rings and links.

SIDEWALKS

Cement Tile. Methods and Costs of Cement Tile Sidewalk Construction at St. Paul, Minn., E. G. Briggs. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 343-344. Table giving contract prices covering operations for past four years on sidewalk work and incidentals connected with construction from which considerable additional revenue has been received.

SIGNAL CORPS, U. S. A.

Achievements. Scope and Development of the Signal Corps, U. S. A., L. D. Wildman. Jl. Western Soc. Engrs., vol. 25, no. 8, Apr. 20, 1920, pp. 267-277 and (discussion) pp. 278-280. Account of the achievements of the Signal Corps which at the outbreak of war had but twelve regular officers and 1200 men, these figures within three months expanding into 15,900 officers and 200,000 men. Reference to the work of the Bureau of Standards and the Nat. Advisory Committee.

SIGNALING

Acoustic. Audible Electric Signals in Industrial Plants, and Acoustical Engineering, V. Karapetoff. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 1, Jan. 1920, pp. 13-19, 2 figs. Plea for wider use of acoustic signals in industrial plants. It is shown that much time is wasted by officials, experts and employees in trying to locate one another. Code system of calling is explained.

Light, Speed by Use of. Speeds in Signaling by the Use of Light, W. E. Forsythe. Physical Rev., vol. 16, no. 1, July 1920, pp. 62-69, 3 figs. Experiments carried out to determine relative lengths of dot, dash and space necessary for greatest speed. Ratio dot:dash:space ::1:4:3 was agreed upon by various observers as best for maximum speed.

Railway. See RAILWAY SIGNALING.

Submarine. See SUBMARINE SIGNALING.

Subways. See SUBWAYS, Signaling.

SILICA BRICK

Properties. Silica Bricks (Les briques de silice), Pierre Gilard. Revue Universelle des Mines, vol. 2, no. 3, July-Aug. 1919, pp. 559-582, 12 figs. Survey of technical researches concerning influence of nature of silica on properties of brick.

Specific Gravity. Apparent vs. True Specific Gravity of Silica Bricks, Leon R. Office. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 833-835. Of 27 samples tested, 22 showed slightly higher, 2 same, and 3 a lower true specific gravity. By taking average of differences, true specific gravity is found to be 0.011 higher than apparent specific gravity.

SILICATE ROCKS

Analysis. The Analysis of Silicate and Carbonate Rocks, W. F. Hillebrand. Dept. of Interior, U. S. Geological Survey, bul. 700, 1919, 185 pp., 23 figs. Summary of methods of analysis used with notes on chemical reagents and information on porcelain, glass and platinum ware and substitutes for platinum ware.

SILICATES

Analysis. Analysis of Natural Silicates (Contribution à l'analyse des silicates naturels), Louis Duparc. Bulletin de la Société française de Minéralogie, vol. 42, no. 4, April 1919, pp. 138-241, 3 figs. Suggested processes of analysis.

SILLIMANITE

See REFRACTORIES, Sillimanite.

SILK

Artificial. The Silkworm's Formidable Competitor, R. G. Skerrett. Sci. Am., vol. 121, no. 19, Nov. 8, 1919, pp. 458, 4 figs. Outline of method of manufacture from paper pulp.

SILOS

Design. Simplification of Calculations for Silos (Vereinfachung der Berechnung der Silos), Joh. Arn. Pieters. Beton u. Eisen, vol. 19, nos. 6 and 9-10, Apr. 8 and June 5, 1920, pp. 72-75 and 109-112, 6 figs. Gives formulæ for calculation of side pressure and calculations of silos with rectangular, square and circular cells.

Grain. 40,000-Ton Grain Silo at the King George Dock, Hull. Eng., vol. 128, no. 3328, Oct. 10, 1919, pp. 360, 364-366, 16 figs., partly on two supp. plates. It is made of reinforced concrete and comprises two blocks each 96 feet wide and 241 feet long, in which are placed elevating, weighing, cleaning and other machinery.

Reinforced-Concrete. A Modern Grain Storage, Cleaner and Conveyor. Eng. Progress, vol. 1, no. 1, Jan. 1920, pp. 12-15, 7 figs. Description of grain silo erected in Dresden. Consists entirely of reinforced concrete, and has total capacity of about 13,500 tons.

SILVER

Deposits, Randsburg, Cal. The Kelly Silver Mine, at Randsburg, California, Jay A. Carpenter. Eng. & Min. Jl., vol. 108, no. 23, Dec. 27, 1919, pp. 940-943, 3 figs. Character of deposits.

Electrodeposition of. See ELECTROPLATING, Silver.

Production in 1919. Silver in 1919, S. R. Wagel. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 109-111, 1 fig. Statistics of production.

Reflectivity of. See REFLECTIVITY.

SILVER METALLURGY

Concentrating Lead-Carbonate Ores. The Shattuck-Arizona Mill for Concentrating Silver Lead-Carbonate Ores, Glenn L. Allen. Eng. & Min. Jl., vol. 110, no. 16, Oct. 16, 1920, pp. 759-762, 4 figs. How low-grade oxidized ore is concentrated at profit. Exceedingly fine crushing necessary. Table treatment and sulphidizing followed by flotation gives satisfactory lead recovery.

Extraction and Refining. The Extraction and Refining of Silver. Metal Industry (Lond.), vol. 16, no. 10, Mar. 5, 1920, pp. 193-194. Summary of report by Professor H. C. H. Carpenter and Professor C. G. Cullis on World's Production of Silver, which was included among appendices to report of committee appointed by British Secretary of State for India to inquire into Indian exchange and currency.

Fume Precipitation. See FUME, Precipitation.

Silver-Tin Ore Treatment. Roasting and Chloridizing of Bolivian Silver Tin Ores, M. G. F. Söhnlein. Min. & Metallurgy, no. 164, Aug. 1920, pp. 21-22, 2 figs. Ore is crushed dry, given chloridizing roast, leached with water and hyposulphite solution to extract gold, silver and copper, and concentrated for tin with or without regrinding. (Abstract.)

Smelting and Refining. Smelting in Namtu, Burma, Arthur W. Jenks. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14, 1920, pp. 309-312, 2 figs. Details of treatment of lead-zinc-silver ore in smelter and refinery.

SILVER MINING

Dolly Varden Mine. The Dolly Varden Mine, Robert Dunn. Eng. & Min. Jl., vol. 109, no. 11, Mar. 13, 1920, pp. 643-647, 11 figs. Description of silver mine which has yielded approximately 400,000 oz. of silver from 6000 tons of ore within first five months after production began.

Sonora, Mexico. The Las Chispas Mine, in Sonora, Mexico, Fernando Montijo, Jr. Min. and Sci. Press, vol. 121, no. 2, July 10, 1920, pp. 58-60, 3 figs. Ore is mainly silver, analysis of shipping ore showing 350 oz. of silver to the ton. Mine has not yet been worked to any great extent.

[See also GOLD MINING, Electrical Equipment for.]

SILVER ORE

British Columbia. The High Grade Silver Ores of the Stewart District, British Columbia, Victor Dolmage. Can. Min. Jl., vol. 41, no. 22, June 4, 1920, pp. 454-458, 10 figs. The three classes of ores in district are (1) stephanite-native silver ore, which is richest silver ore of district, carrying as high as 3000 oz. of silver to ton; (2) type known in district as "Black sulphide ore," which carries from 500 to 1000 oz. to ton; and (3) lower grade silicious ore.

Utah. The Ophir Mining District, Utah, F. M. Wichman. Eng. & Min. Jl., vol. 110, no. 12, Sept. 18, 1920, pp. 560-563, 3 figs. Attempt to correlate ophir sedimentaries with those of Tintic district. Great anticline, in which chief ore deposits occur, and ophir fault principal geological features. Locality steady producer since 1870.

See also SILVER, Deposits.

SIPHONS

Inverted. See CANALS, Inverted Siphon.

Principle of, Application. The Siphon and Its Relation to Heating Work, T. W. Reynolds. Heat. & Vent. Mag., vol. 16, no. 12, Dec. 1919, pp. 29-35, 16 figs. How this principle is applied in such devices as steam gages, cocks, manometers, draft gages, loop seals and oil separators.

[See also AQUEDUCTS, Reinforced-Concrete.]

SLAG

Blast-Furnace. Blast Furnace Slag in the Building Industry (Hochofenschlacke im Baugewerbe), A. Moye. Tonindustrie-Zeitung, vol. 43, no. 153, Dec. 30, 1919, pp. 1380-1381. Review of a book entitled The Use of Blast Furnace Slag in the Building Industry, by A. Guttmann, which is a summary of numerous publications, the source of all information being given in a bibliography appended to work.

Experiments with Blast-Furnace Slag (Versuche mit Hochofenschlacke), H. Burchartz. Stahl u. Eisen, vol. 40, no. 24, June 17, 1920, pp. 814-819. Tables showing results of tests of slag to determine weight per unit volume, specific gravity and density; and of slag and quarry stone samples stored in open air, per unit volume, which showed that weight even after five years' open-air storage, did not vary, and that the slag suffered no physical or chemical changes.

Manganiferous Silicate. The Reduction of Manganiferous Silicate Slags, Edward F. Kern. General Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper 15, pp. 221-232. Calculations are made of theoretical power needed for reduction and as sensible heat in products, and net thermal efficiency of electric-furnace operations is determined. Experiments are described in which percentages of manganese, silicon and iron reduced and escaping reduction were determined and also proportions volatilized.

SLUICES

See PIPE LINES, Design.

SMELTERS

Design of. Elements of Smelting-Plant Design, Oliver E. Jager. Min. & Sci. Press, vol. 120, nos. 5 and 6, Jan. 31 and Feb. 7, 1920, pp. 153-157 and 195-201, 2 figs. Suggestions in regard to selecting appliances and illustrations of manner of calculating furnace charge.

[See also STACKS, Fume Losses.]

SMELTING

See ELECTRIC FURNACES, Smelting.

SMOKE ABATEMENT

Salt Lake City. Fuel Utilization and Smoke Abatement in Salt Lake City, Osborn Monnett. Power, vol. 52, no. 6, Aug. 10, 1920, pp. 204-207, 4 figs. Gives portion of Bur. of Mines report done in coöperation with city of Salt Lake and University of Utah, and describes some of power- and heating-plant conditions found in this investigation. It is concluded that, in view of limited gas market in Salt Lake City and of superiority of low-temperature coke as a domestic fuel, low-temperature process seems well worth careful consideration as a future solution of the domestic smoke problem.

[See also BOILER FIRING, Smoke Abatement.]

SMOKE PREVENTION

Hemmann Apparatus. The Hemmann Smoke and Soot-Prevention Apparatus (Rauch- und Russverhütungsapparat), A. Reich. Gesundheits-Ingenieur, vol. 43, no. 5, Jan. 31, 1920, pp. 54-55. Description of apparatus said to have been in satisfactory operation since February, 1919.

SNAP RINGS

See PISTONS, Locomotive.

SNOW PLOWS

Friedman Snow Tank. New Type of Plow Cleans Snow from Streets at Low Cost. Contract Rec., vol. 34, no. 15, Apr. 14, 1920, pp. 340-341, 2 figs. Friedman snow tank, which, it is claimed, has been tried out in New York with splendid results. It is stated that four 5-ton trucks were filled with ice in less than 3 min., and saving of $5.48 per 8 cu. yd. over hand methods is effected.

Railway. A Heavy-Duty Interurban Snow Plow, M. S. Ferguson. Elec. Ry. Jl., vol. 55, no. 7, Feb. 14, 1920, pp. 338-339, 1 fig. Nose plow built by Indiana line, equipped with air and designed for operation with locomotive.

Snow Fighting Equipment, W. H. Winterrowd. Ry. Rev., vol. 66, no. 24, June 12, 1920, pp. 973-978, 8 figs. Also in Can. Ry. & Marine World, no. 272, Oct. 1920, pp. 525-529, 14 figs. History of development and use of apparatus for clearing of railway tracks and yards of accumulations of snow. Various types of equipment adapted to this use are classified and descriptive reference to latest approved apparatus of each type is made. From paper read before Section III—Mech. of Am. R. R. Assn.

SNOW REMOVAL

Electric Railway Tracks. Are You Ready for the Coming Winter? J. S. Dean. Elec. Ry. Jl., vol. 56, no. 15, Oct. 9, 1920, pp. 710-715, 11 figs. Types of snow plows for removing snow from electric railway tracks.

Highways. New Method of Snow Removal. Can. Engr., vol. 38, no. 19, May 6, 1920, pp. 437-438, 3 figs. Christie four-wheel-drive truck equipped with bucket-type conveyor driven by Sterling engine.

Solving Snow Problem on Highways, A. H. Hinkle. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 642-644, 3 figs. From bulletin offering suggestions for keeping roads open for motor traffic during winter months, prepared by Dept. Highway Commissioner of Ohio, and shaped snow plow designed by Ohio State Highway Dept. is described.

Rotary Plow. Rotary Snowplows Clear Streets in Canadian Cities. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 221-222, 3 figs. Machine is hauled by horses and carries gasoline engine to drive cutters.

Snow Melter. A Snow-Removal Method Used in Finland. Am. City, vol. 23, no. 4, Oct. 1920, pp. 360-361, 1 fig. Hot air and combustion gases from furnace are forced straight through snow to be melted.

Snow Sweepers. Machine for Filling Snow Sweeper Brushes. Elec. Ry. Jl., vol. 56, no. 2, July 10, 1920, pp. 87-88, 1 fig. Built in shops of Cleveland Ry., said to have effected marked economy in filling of rotary brooms.

[See also STREET CLEANING, A. S. M. I. Report.]

SOAP BUBBLES

See LIQUID FILMS.

SOAP SOLUTIONS

See ELECTROLYTES, Colloidal.

SOAPS

Colloid Chemical Studies. Colloid Chemical Studies of Soaps, Martin H. Fisher and Marion O. Hooker. Chem. Engr., vol. 27, nos. 10 and 11, Oct. and Nov. 1919, pp. 253-257 and 271-272, 8 figs. Oct.: On potassium aleate and "salting out" of soaps. Nov.: Reaction of soaps to indicators.

SOAPSTONE

See TALC, Sources; Uses of.

SOCIETIES

Engineering. See ENGINEERING SOCIETIES.

SODIUM

Fluorescence. See FLUORESCENCE, Excitation of.

Production in 1919. See MAGNESITE, Production in 1919.

SODIUM NITRITE

Properties of. Some Properties of Sodium Nitrite (Sur quelques propriétés due nitrite de sodium), M. C. Matignon et G. Marchal. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 4, Jan. 26, 1920, pp. 232-233. Measurement of melting point, head of dissolution, heat of neutralization, etc.

SODIUM SALTS

Deposits. See MAGNESIUM SALTS, Deposits.

[See also SODIUM NITRATE.]

SOILS

Bearing Power. See FOUNDATIONS, Bearing Value of Soils.

Permeability of. See IRRIGATION, Soils.

SOLAR ENERGY

Utilization of. Can We Utilise Solar Heat-Energy, Philip R. Coursey. Wireless World, vol. 8, no. 6, June 12, 1920, pp. 181-183, 2 figs. Deals with thermoelectricity and some of its applications, and describes typical form of thermopile suitable for experiments designed mainly to indicate properties of thermoelectricity.

SOLAR RADIATION

See METEOROLOGY, Solar Radiation and Weather.

SOLDERS

Types of. Solders and Solder Alloys (Lötmetalle und Lötlegierungen), E. H. Schulz. Das Metall, year 1919, no. 23, Dec. 10, 1919, pp. 313-316, 2 figs. Notes on characteristics of soft solder, hard solder and those for special purposes and for soldering rare metals. Mention is made of certain substitute metals for soft solder used during war, such as cadmium, antimony and mercury.

SOLENOIDS

Magnetic Field of. Magnetic Field of a Solenoid (Champ magnétique d'un solénoïde), O. Billieux. Revue Générale de l'Électricité, vol. 6, no. 24, Dec. 13, 1919, pp. 827-831, 4 figs. Numerical application of formulæ deduced in previous installments.

Rectangular-Section. On the Solenoid with Rectangular Cross-Section, Yasujiro Niwa. Researches of Electrotechnical Laboratory, Dept. of Communications, Tokyo, Japan, no. 73, Nov. 1918, 31 pp., 13 figs. partly on 5 supp. plates. Formulæ for intensity inside and outside solenoid with rectangular cross-section and also for coefficient of self-induction are derived and applied to numerical cases.

SOLIDIFICATION

Phenomena of. Effect of Surface Tension on Crystalline Form, Cecil M. Desch. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 773-776, 9 figs. Account of experimental investigation undertaken to test hypothesis of Quincke, according to which metals and other substances immediately before solidification from liquid state separate into two immiscible liquids, one of which is formed in smaller quantity than the other.

SOLIDS

Loss of Weight Through Movement. Experimental Conclusions on Variation of Weight which a Body Undergoes When Moved in an Easterly or Westerly Direction (Experimenteller Nachweis der Schwereänderung, die ein auf normal geformter erdoberfläche in östlicher oder westlicher Richtung bewegter Körper durch diese Bewegung erleidet), Roland Eötvös Annalen der Physik, vol. 59, no. 8, Sept. 19, 1919, pp. 743-752, 4 figs. Explains resonance and compensation methods.

SOLUTION

Molecular Theory of. On the Molecular Theory of Solution, Samuel Clement Bradford. Lond., Edinburgh & Dublin Phil. Mag., vol. 38, no. 228, Dec. 1919, pp. 696-705. Order in which substances range themselves with regard to any given property of solutions discussed from viewpoint of molecular attractions.

Aqueous, Ionization of. The Determination of the Ionization of an Aqueous Solution, W. R. Bousfield. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 47-73, 2 figs. Method for determining accuracy of values obtained from conductivity data, freezing point and vapor-pressure measurements.

Colloidal. Contribution to the Study of Colloidal Solutions (Contribución al estudio de las soluciones coloidales), Teófilo Isnardi. Contribución al Estudio de las Ciencias físicas y matemáticas. Universidad nacional de la Plata, vol. 2, no. 43, Sept. 1919, pp. 379-387, 3 figs. Depolarization of Tyndall light in gutta percha solutions was found to vary with concentration, and in silver solutions to diminish as ultrafiltration becomes more thorough.

Conductivity of. Measurement of the Conductivity of Solutions, H. I. Schlesinger and F. H. Reed. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1727-1732, 1 fig. It is pointed out that even though minima obtained in measurement of resistance of solution by usual method may be perfectly sharp, results may nevertheless be incorrect and criteria for determining reliability of measurements and methods for overcoming some of difficulties encountered are suggested.

Ionic Relationships. A Study of the Heats of Dilution of Certain Aqueous Salt Solutions, Allen Edwin Stearn and G. McP. Smith. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 18-32, 7 figs. Experimental determination of reversible molal heats of dilution for solutions of single salts, sodium, potassium and strontium chloride at various concentrations.

Migration Data and Conduction. The Bearing of Migration Data on Conduction in Solutions. The Electrochemistry of Sodium in Acetone, James W. McBain. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 27-46, 1 fig. It is shown that when sum of movement of both ions is equal to total current, solvent cannot be appreciably dissociated. This, it is concluded, invalidates tentative modifications of dissociation theory advanced by various authors.

Salt. Equilibria in Solutions Containing Mixtures of Salts. The System Water and the Chlorides and Sulfates of Sodium and Magnesium at 25 deg., Walter C. Blasdale. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 164-167, 2 figs. Construction of equilibrium diagram of system $MgSO_4$-NaCl at 25 deg. cent.

SONIC POWER TRANSMISSION

See POWER TRANSMISSION, Sonic Waves.

SONIC WAVES

See POWER TRANSMISSION, Sonic Waves.

SOUND

Intensity. Experiments in Binaural Phase Difference Effect with Pure Tones, Margery Simpson. Physical Rev., vol. 15, no. 5, sec. series, May 1920, pp. 421-424, 1 fig. Tuning forks were used for source of pure tones; equal intensity was maintained at the two ears, while a difference in phase was secured by a difference in lengths of sound paths to the two ears. Results were obtained which are best represented by linear relation between the phase difference and angular displacement of sound image or phantom from the median plane. Ratio of phase difference to apparent angular displacement varied with the frequency.

Measurement of. Sound Measuring (Vom Schallmessen), Adrian Mohr. Prometheus, vol. 31, no. 17, Jan. 24, 1920, pp. 129-131, 4 figs. Explains German methods employed during war in locating position of enemy artillery by means

of detonation taking place with firing of gun.

Tone Photography. The Photographic Rendering of Tone Values, Loyd A. Jones. Jl. Franklin Inst., vol. 189, no. 4, Apr. 1920, pp. 469-484, 9 figs. Traces various steps in photographic process and explains factors which affect the objective photographic rendering obtained. Report from research laboratory of Eastman Kodak Co.

Tone Reproduction. On the Theory of Tone Reproduction, with a Graphic Method for the Solution of Problems, L. A. Jones. Jl. Franklin Inst., vol. 190, no. 1, July 1920, pp. 39-90, 14 figs. Paper deals with factor of brightness and brightness differences, giving a graphic solution of the tone reproduction problem, and discussing both the subjective and objective phases of the problem.

Vibrations of Pianoforte String. On Kaufmann's Theory of the Impact of the Pianoforte Hammer, C. R. Raman and Bhabonath Banerji. Proc. Roy. Soc., vol. 97, no. A 682, Apr. 1, 1920, pp. 99-110, 4 figs. Revision and extension of theory of vibrations of pianoforte string developed by Kaufmann (Annalen der Physik, vol. 54, 1895).

Water-Borne, Receivers for. The Theory of Receivers for Sound in Water, H. A. Wilson. Physical Rev., vol. 15, no. 3, sec. series, Mar. 1920, pp. 178-205, 9 figs. After proving that a receiver must have a small volume to be efficient, author considers in detail case of small spherical receiver connected to car by a cylindrical tube, and it is shown that a resonating receiver with properly chosen tube may concentrate into tube energy from an area about 850 times the cross-section of tube. Equations are derived for case of symmetrically arranged receivers, all equidistant from source of sound. Conditions for complete transmission for given frequency are determined for case of small receivers mounted in a plane in front of a totally reflecting parallel surface.

Waves. The Pressure of Sound, Warren Weaver. Physical Rev., vol. 15, no. 5, sec. series, May 1920, pp. 399-404, 1 fig. Argument is given, following method by Larmor, to show that a certain general type of radiation will exert a pressure. Pressure of small sound waves is found to agree with this result, but for finite waves, conditions for application of argument are not satisfied.

SOUND RANGING

Listening Devices. Ranging Equipment of the U. S. Army, J. B. Cress. Military Engr., vol. 12, no. 63, May-June 1920, pp. 275-278 and (discussion) 278-280, 5 figs. Sight (or flash) and sound ranging as developed during the war. Sound ranging for enemy battery positions most important.

[See also ARTILLERY, Sound Ranging of Guns.]

SPARK GAPS

See SPARK PLUGS.

SPARK PLUGS

Aeroplane-Engine. Engines—Applied Design. Eng. Division Air Service (Dayton, O.). Technical Orders no. 8, Sept. 1919, pp. 27-35, 3 figs. Account of tests conducted to determine suitable dimensions for aviation spark plugs.

B-G Type. The B-G Spark Plug. Aerial Age, vol. 10, no. 7, Nov. 10 and 17, 1919, p. 247, 2 figs. Also in Flying, vol. 8, no. 11, Dec. 1919, p. 932, 3 figs. Design possesses self-cleaning feature which is obtained by high pressure air blast directed over sparking points on all four strokes of engine cycle.

Breakdown Voltage. Effect of Temperature and Pressure on the Sparking Voltage. Nat. Advisory Committee for Aeronautics, report no. 54, 1920, 11 pp., 7 figs. See also Aerial Age, vol. 10, no. 19, Feb. 23, 1920, pp. 691-693, 6 figs. Experiments are quoted which confirm relation that breakdown voltage of spark gap depends only upon density of gas and varies with pressure and temperature only as they affect density. This relation was found to be valid up to 800 deg. cent., and 8 atmos. pressure. It was found that voltage required for spark plug set at 0.020 in. in aviation engine of moderate compression had a magnitude of 6000 volts.

Causes of Failure. The General Causes of Failure of Spark Plugs, F. B. Silsbee. Automotive Industries, vol. 43, no. 2, July 8, 1920, pp. 66-71. Analysis of possible causes of defective spark-plug action due to design, and suggested remedies for difficulties. Data obtained from tests on many varied designs and reports from France.

Ceramic Insulators for. Properties and Preparation of Ceramic Insulators for Spark Plugs. Nat. Advisory Committee for Aeronautics, report no. 53, 1920, 35 pp., 15 figs. Resistance of insulators was measured at temperatures between 200 and 900 deg. cent. and with both alternating and direct current at voltages as high as 2000 volts. Basis of comparison for different materials assumed is "effective temperature" to which they must be heated in order to reduce their resistivity to one megahom per cm. cube. It is stated that material having effective temperature smaller than 400 deg. cent. should be used only when design of plug is such that insulator is extremely well cooled.

Defects and Tests. Spark Plug Defects and Tests. Nat. Advisory Committee for Aeronautics, report no. 51, 1920, 32 pp., 157 figs. Experience in altitude laboratory of Bureau of Standards and authoritative information are said to indicate that: Fouling with carbon deposit causing short-circuit accounts for over 50 per cent of trouble encountered in practice, particularly at high altitudes; breaking of insulator for nearly 40 per cent of trouble; fouling with oil deposit causing open circuit occurs quite frequently when first starting engine, but seldom after engine is once running; preignition, conduction through insulator, and electrical puncture of insulator are of relatively rare occurrence. Cause and identification of each type of failure are described and remedies are suggested.

Electrode Cements. Cements for Spark-Plug Electrodes, Homer F. Staley. Tech. Papers Bur. Standards, no. 155, Feb. 21, 1920, 10 pp. Experiment of various typical cements for spark-plug electrodes made by mixing silicate of soda with different powdered solids, a mixture of raw kaolin with silicate of soda was found most satisfactory. Practice of cementing electrode wires with high coefficient of thermal expansion into porcelains with low coefficients is mentioned as cause for cracking porcelains in spark plugs in use.

Gas-Tightness Tests. Gas Tightness Tests of Spark Plugs. Automotive Industries, vol. 42, no. 24, June 10, 1920, p. 1297. It is pointed out that as a slight escape of hot gases rapidly raises temperature of plug, numerous failures are due to this cause. Report of Bur. of Standards giving results of tests of several hundred plugs and recording conclusions drawn.

Insulators. Methods of Measuring Resistance of Insulators at High Temperatures, F. B. Silsbee and R. K. Honaman. Aerial Age, vol. 11, no. 24, Aug. 23, 1920, pp. 806-809, 11 figs. Report on preliminary experiments made on conductivity of spark-plug insulators in order to develop satisfactory comparative method for testing various materials. Measurements were

made at temperatures between 200 deg. and 900 deg. cent. and with both alternating and direct current at voltages as high as 2000 volts. Report No. 53 of Nat. Advisory Committee for Aeronautics.

Molla. An Air-Cooled Spark Plug: The Molla. Flight, vol. 12, no. 8, Feb. 19, 1920, p. 203, 4 figs. Cold air entering series of holes in body either by action of propeller or by travel of machine passes around insulator and leaves by rearward holes.

Nickel Electrodes, Deterioration of. A Study of the Deterioration of Nickel Spark-Plug Electrodes in Service, Henry S. Rawdon, A. I. Krynitzky. Technologic Papers, Bur. of Standards, no. 143, 1920, 16 pp., 21 figs. on supplement plates. Service deterioration of nickel spark-plug electrodes is shown to be due to an intercrystalline embrittlement of wire. It is claimed that cohesion between grains is so lessened that network of intercrystalline fissures is formed and also, under certain conditions, well-defined transverse cracks which extend deeply into wire.

Preignition Caused by. Preignition and Spark-Plugs, Standwood W. Sparrow. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 129-132, 14 figs. Experiments were made with various types of spark plugs in some of which porcelain part was cracked and subsequently partially removed. It was found that preignition occurred when porcelain was so placed that it became instrumental in heating central electrode to igniting temperature.

Specifications. Motor Transport Corps Spark-Plug Specifications. Jl. Soc. Automotive Engrs., vol. 6, no. 5, May 1920, p. 281. Specifications for spark plugs to be purchased for Motor Transport Corps to be used on military equipment. Methods of testing for dielectric strength and thermal cracking and gas-tightness are specified.

Steel vs. Brass Shells. Temperatures in Spark Plugs Having Steel and Brass Shells. Nat. Advisory Committee for Aeronautics, report no. 52, 1920, 8 pp., 2 figs. Measurements indicated that temperatures of brass shells are considerably higher than steel in each case; also that temperatures in center of porcelain are higher in case of brass shells. It is therefore concluded that steel is to be preferred to brass for spark-plug shells.

Subsidiary Gap as Remedy for Fouling. The Subsidiary Gap as a Means for Improving Ignition. Nat. Advisory Committee for Aeronautics, report no. 57, 1920, 16 pp. Theory of action of series gap is discussed and account given of effect upon sparking ability of plug produced by changes in values of electrical resistance of fouling and of capacities in parallel with plug and with magnets or coil. It is concluded that series gap may be used as remedy for considerable part of troubles due to fouling of plugs.

Tests. Testing the Sparking Plug, B. C. Rayner. Autocar, vol. 44, no. 1264, Jan. 10, 1920, pp. 74-75, 5 figs. Analysis of methods of detecting faulty plugs.

Visible Ignition. A Visible Ignition Spark Plug, and Another with an Air-Cooled Central Electrode. Auto, vol. 25, no. 36, Sept. 2, 1920, p. 921, 2 figs. Leda ignition plugs. Central electrode is hollow and is fitted at top with cup-shaped terminal and massive cap containing circular window of transparent material.

SPECIFIC HEAT

Saturated Vapors. Specific Heat of Saturated Vapors at Low Temperatures (Sur la chaleur spécifique des vapeurs saturées aux basses températures), E. Aries. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 9, Aug. 30, 1920, pp. 456-458. Proof for proposition: the specific heat of a saturated vapor is very small and positive near absolute zero, at which temperature it becomes zero.

SPECIFICATIONS

Aeroplane Parts. See AEROPLANES, Specifications.

Aluminum. See ALUMINUM, Navy Specifications.

Aluminum-Alloy Castings. See ALUMINUM ALLOYS, Aeroplane-Engine.

Asphalt Pavements. See PAVEMENTS, ASPHALT, Specifications.

Automobile Bodies. See AUTOMOBILES, Standardization.

Automobile Headlights. See AUTOMOBILES, Headlights.

Bituminous Pavements. See PAVEMENTS, BITUMINOUS, Specifications.

Brass. See BRASS, Specifications.

Brick Pavements. See PAVEMENTS, BRICK, Specifications.

Cement-Concrete Buildings. See HOUSES, CONCRETE, Specifications.

Concrete Roads. See ROADS, CONCRETE, Specifications.

Copper Conductors. See ELECTRIC CONDUCTORS, Specification, British.

Cottages. See HOUSES, Cottages.

Gas Appliances. See GAS APPLIANCES, Specifications for.

Gasoline. See GASOLINE, Specifications.

Gypsum. See GYPSUM, Specifications.

Incandescent Lamp Caps and Holders. See ELECTRIC LAMPS, INCANDESCENT, Standard Lamp Caps.

Incandescent Lamp Plugs and Sockets. See ELECTRIC LAMPS, INCANDESCENT, Standard Plugs and Sockets for.

Lime. See LIME, Specifications.

Lubricating Oils. See LUBRICATING OILS, Specifications.

Motor Trucks. See MOTOR TRUCKS, Specifications.

Non-Ferrous Metals. See NON-FERROUS METALS, Specifications.

Paint Oils. See OILS, Tung.

Paints. See PAINTS, Specifications.

Pavements. See PAVEMENTS, Specifications; PAVEMENTS, ASPHALT, Specifications; PAVEMENTS, BITUMINOUS, Specifications; PAVEMENTS, BRICK, Specifications.

Paving Brick. See PAVING BRICK, Specifications.

Portland Cement. See CEMENT, PORTLAND, Specifications.

Rails. See RAILS, Carbon Steel, Specifications for.

Reinforced Concrete. See CONCRETE, REINFORCED, Specifications.

Road Materials. See ROAD MATERIALS, Standard Specifications.

Roads. See ROAD CONSTRUCTION, Specifications for Ashokan Highways.

Roads, Concrete. See ROADS, CONCRETE, Specifications.

Rubber Belting. See RUBBER, Mechanical Goods.

Rubber Goods. See RUBBER GOODS, Specifications.

Rubber Mechanical Goods. See RUBBER, Mechanical Goods.

Scales. See SCALES, Specifications; Track.

Sewer Pipe. See SEWER PIPE, Specifications.

Sewers, Concrete. See SEWERS, Concrete, Specifications for.

Spark Plugs. See SPARK PLUGS, Specifications.

Steam Hose. See HOSE, Steam.

Steel. See STEEL, Specifications.

Steel Bridges. See BRIDGES, RAILWAY, Steel, Specifications for.

Structural Steel. See STRUCTURAL STEEL, Specifications.

Structural Timber. See TIMBER, Specifications.

Train Lighting. See CAR LIGHTING, Equipment, Specifications for.

Turpentine. See TURPENTINE, Specifications for.

White Lead. See PAINTS, White Lead.

Wooden Bridge Timbers. See BRIDGES, RAILWAY, Wooden.

Zinc Oxide. See PAINTS, Zinc Oxide.

SPECTRA

Arc. Wave Lengths Longer Than 5500A In the Arc Spectra of Seven Elements, C. C. Kiess, W. F. Meggers. Sci. Papers, Bur. of Standards, no. 372, May 7, 1920, 73 pp., 1 fig. Concave-grating spectrograph of Bur. of Standards was used in photographing yellow, red, and infra-red arc spectra of titanium, vanadium, chromium, manganese, molybdenum, tungsten and uranium. Results are given in tables.

Atomic Systems with Complex Nucleus. Contribution to the Quantum Theory of Spectrum Emission: Spectra of Atomic Systems Containing a Complex Nucleus, L. Silberstein. Lond., Edinburgh & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 46-66. Investigation, on lines of quantum theory, of spectrum corresponding to atomic system with differently shaped complex nucleus, such as nucleus consisting of two point-charges, acting as two fixed centers.

See also ATOMS, Constitution.

Copper. See COPPER, Spectrum of.

Helium. See HELIUM, Spectrum of.

Incandescent Graphite. Spectra Emitted by Red Fringe and Luminous Vapor in Vicinity of Incandescent Graphite Plate (Sur les spectres émis par la frange rouge et la vapeur lumineuse au voisinage d'une lame de graphite incandescente), G. A. Hemsalech. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1034-1036. Spectra are said to be due to two different species of emission centers.

Krypton and Xenon. Measurements of Wave Lengths in the Spectra of Krypton and Xenon, Paul W. Merrill. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 345, Oct. 3, 1919, pp. 251-257, 1 fig. In krypton 37 new lines are said to have been measured between 6576A and 8928A; and in xenon 52 new lines between 6318A and 9162A. Attention is called to probable analogy between spectra of rare gases of neon, argon, krypton, and xenon which investigation is said to have brought to light.

Metals of Low Fusing Point. Arc Spectrum of Metals with Low Fusion Point (Sur les spectres d'arc direct des métaux à point de fusion peu élève), A. de Gramont. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 1, Jan. 5, 1920, pp. 31-38, 4 figs. Comparative spectrograms of spark spectra with both directly obtained and carbon arcs for zinc, cadmium, tin, lead, antimony, bismuth, and aluminum.

Rare Earths. Spectral-Analytical Investigation of Certain Rare Earths and Metals Spektralanalytische Untersuchung einiger Erden und Metalle), Bruno Simmersbach. Edel-Erden u. -Erze, vol. 1, no. 12, Mar. 2, 1920, pp. 136-139. Review of spectrum analyses of aluminum, argon, barium, iron, gold, magnesium, sodium, silver, zinc, tin, calcium, copper, molybdenum, helium, etc.

Röntgen Field. The Broadening of the Spectral Lines in the Röntgen Field (Die Verbreiterung von Spektrallinien im Röntgengebiet), L. Vegard. Physikalische Zeitschrift, vol. 21, no. 1, Jan. 1, 1920, pp. 6-7. It is pointed out that broadening of lines in ordinary spectrum is generally believed to be due either to the Doppler or to the Stark effect, but writer suggests another possible cause which he believes may be of particular importance for the Röntgen spectra.

Sodium. See FLUORESCENCE, Excitation of.

Tungsten. See TUNGSTEN, Röntgen Spectrum of.

X-Ray. On the Spectrum of X-Rays from an Aluminum Target, William Duane and Takeo Shimizu. Phys. Rev., vol. 14, no. 5, Nov. 1919, pp. 389-393, 1 fig. Object of research was to investigate whether or not frequencies of K series are highest X-ray frequencies characteristic of chemical element. Emission spectrum of aluminum was examined between wavelengths 0.1820 x 10-8 cm. and 1.259 x 10-8 cm.

The Intensities of X-Rays of the L Series—II. The Critical Potentials of the Platinum Lines, David L. Webster. Proc. Nat. Acad. Sci., vol. 6, no. 1, Jan. 1920, pp. 26-35, 3 figs. Experimental investigation of laws relating intensity to potential for L-series lines and comparison with current theories of X-ray spectra.

SPECTROGRAPHS

Positive-Ray. A Positive Ray Spectrograph, F. W. Aston. Lond., Edinburgh & Dublin Phil. Mag., vol. 38, no. 228, Dec. 1919, pp. 707-714, 4 figs. Precision methods of positive-ray analysis are discussed and means of improving brightness of beam analyzed are suggested. Theoretical electrical and magnetic analogues of optical cylindrical lenses for focussing positive rays are shown to be possible.

Ultra-Violet Study. Spectrograph for Extreme Ultraviolet Study (Dispositif spectrographique pour l'étude de l'ultraviolet extrème), Léon et Eugene Bloch. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 4, Jan. 26, 1920, pp. 226-228. Combination of constant deviation Broca-Pellin fluorine prism and fluorine lenses.

SPECTROMETERS

Bragg. X-Rays and Crystals (Rayons X et cristaux), F. Canac. Radium, vol. 11, no. 9, July-Aug. 1919, pp. 266-275, 11 figs. Study of defraction of waves on crystals. Description of Bragg spectrometer.

SPECTROMETRY

X-Ray. Precision Measurements in the X-Ray Spectra, Manne Siegbahn and A. B. Leide. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 639-646 and 647-651, 5 figs.; pp. 639-646: Results of investigation of K- and L-series, pp. 647-651: Description of X-ray spectrograph for medium wave length.

The Fundamental Constants of X-Ray Spectrometry (Sur les constantes fondamentales de la spectrométrie des rayons X), M. Ledoux-Lebard and M. Dauvillier. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 18, Nov. 3, 1919, pp. 788-791. Concerning different values found by various investigators for reticular distance in rhombohedral ele-

mentary particle of calcite of planes of rhombohedron and plane angle at vertex.

SPECTROPHOTOMETRY

Photoelectric. Photoelectric Spectrophotometry by the Null Method, K. S. Gibson. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 349, Oct. 11, 1919, pp. 325-352, 10 figs. It is believed in consequence of experimentation by Null method that between wave lengths 410 and 550 mm. inclusive, certainty of measurements is not greater than 0.01 for values of transmission between zero and 1, and not greater than 0.003 for values between zero and 0.1; and beyond this range as far as 390 and 600 mm. certainty is slightly greater, being at these wave lengths about twice as great as throughout better range.

SPELTER

See ZINC.

SPIEGELEISEN

See STEEL MANUFACTURE, Spiegeleisen, Use in.

SPIKES

See RAILWAY TRACK, Spikes.

SPLINES

Involute. Methods of Generating the Involute Spline and Its Application, Douglas T. Hamilton. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 149-154, 4 figs. Brief outline of advantages claimed for involute splines: They possess greater possibilities for securing interchangeability between parts; the involute can be generated much more accurately; the involute has a tendency to keep the parts concentric with each other and when used in an automobile transmission this would have the advantage of decreasing the noise of the gears; and number of standards considerably reduced, resulting in lower tool and manufacturing costs.

SPRAY PONDS

Cooling Towers vs. Spray Ponds, H. M. Brayton. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 742-744. Comparison with cooling tower.

SPRING MOTORS

Krasco. Manufacturing Krasco Spring Motors, Edward K. Hammond. Machy. (N. Y.), vol. 26, nos. 8 and 9, Apr. and May 1920, pp. 737-741 and 863-868, 23 figs. Description of the "Krasco" phonograph motor and organization and arrangement of the Krasberg Eng. & Mfg. Corporation's plant.

SPRINGS

Automobile. Heat Treating Automobile Springs and Methods of Manufacture, Harry E. Hemstreet. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 160-167. Together with exposition of physical phenomena taking place in hardening of steel.

Compression. Steel Compression Springs of Circular Cross-Section, T. F. Stacy. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 581-582, 4 figs. Charts developed by writer in connection with his work for Hydraulic Press Manufacturing Co. Charts simplify calculations involved in design of compression springs varying in size from those used on checks of small valves to those for pull-back springs on large hydraulic presses and for shock absorbers on large weighted accumulators.

Heat Treatment. See Automobile.

Helical. Deformation of a Helical Spring Fixed at the Ends (Déformation d'un ressort dont les extremités sont encastrées), M. Galbrun. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 7, Aug. 17, 1920, pp. 386-389. Formulæ for computing deformation. See vol. 171, no. 9, Aug. 30, 1920, pp. 464-466 for correction of formulæ.

Manufacture of Helical Springs, T. D. Lynch. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 419-420. Kinds of spring steel, its manufacture and rolling. Coiling and heat treatment of silico-managanese spring steel. Physical properties and tests.

See also Compression.

Helical, Multiple. Design of Multiple Helical Springs (Calcolo delle molle ad elica cilindrica multiple), Nicola Fabiano. Rivista Tecnica delle Ferrovie Italiane, vol. 16, nos. 1 and 2, July and Aug. 1919, pp. 1-12, 8 figs. Formulæ for computing dimensions for types used for locomotive support.

Laminated. Design of Laminated Springs, S. H. Jenkinson. New Zealand Jl. of Sci. & Technology, vol. 3, no. 1, Feb. 1920, pp. 16-25, 6 figs. Formulæ are developed for computing dimensions in terms of required strength and flexibility. It is figured out mathematically that spring of maximum strength and flexibility would be obtained by making each leaf full length and tapering each one for whole length of cantilever. Such spring, however, would cut into much more steel and would offer no advantages.

Laminated Springs, T. H. Sanders. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 385-390, 12 figs. Constructional details of semi-elliptic, three-quarter-elliptic and full elliptic types.

Plate. See Laminated.

Testing Machine. Spring Scragging Machine. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 242-244, 4 figs. System adopted for applying scragging tests to springs embodying motor-driven variable rotary oil pump on Hele-Shaw principle. Arrangement permits obtaining about 40 complete strokes of tup per minute.

Volute. See Helical.

SPROCKET WHEELS

Cast-Steel, Machining of. The Machining of Large Cast Steel Sprocket Wheels, H. Varley. Eng. & Indus. Management, vol. 4, no. 9, Aug. 26, 1920, pp. 260-263, 9 figs. Discusses difficulties in machining of cast steel where large production is undertaken, and explains how big output was gained in connection with important detail of Mark V tanks without employing gear-cutting machine.

STACKS

Concrete. Why Concrete Stacks Are Successful, A. C. Irwin. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1012-1013, 1 fig. Properties of concrete which are said to render material capable of withstanding evacting service.

Fume Losses. Stack Losses at Arizona Copper Co., J. Owen Ambler. Chem. & Metallurgical Eng., vol. 22, no. 7, Feb. 18, 1920, pp. 305-306, 2 figs. Practice of western company for testing fume loss.

[See also CHIMNEYS.]

STADIA MEASUREMENTS

See SURVEYING, Stadia Measurements.

STAIRWAYS

Reinforced-Concrete. See CONCRETE CONSTRUCTION, REINFORCED, Stairways.

STALLOY

See IRON, Silicon.

STANDARDIZATION

Automotive Industry. Automotive Engineering Standardization and Progress, Coker F. Clarkson. Aviation, vol. 9, no. 5, Oct. 1, 1920, p. 158. Address delivered before Nat. Gas Engine Assn.

Current Standardization Program. Jl. Soc. Automotive Engrs., vol. 5, no. 4, Oct. 1919, pp. 340-341. Notes on Iron and Steel Division; British standardization situation; nickel-chromium steel; division policy; tests of headlamps; British tire standardization; and tire-pump mounting transmission.

See also AUTOMOBILES, S. A. E. Standardization.

Brass. See BRASS, Standardization.

Hoisting Machinery. See HOISTING MACHINERY, Standardization.

Industrial. Engineering and Industrial Standardization. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 544-545. Review of standardization work now in progress, both in this country and abroad, as reported by Am. Eng. Standards Committee and foreign standardizing bodies.

Machine Parts. See MACHINE CONSTRUCTION, Tolerances and Allowance.

Motorships. See MOTORSHIPS, Standardization.

Necessity for. Standards, H. K. Hathaway. Bul. Taylor Soc., vol. 5, no. 1, Feb. 1920, pp. 12-39 and (discussion) pp. 39-42, 22 figs. Necessity for introducing standards of tools, machines, records, and methods is pointed out and instances are quoted of work in various plants operated according to Taylor system, in which by special research and analysis principles were formulated in order to determine standards for various mechanical appliances.

Netherlands Standards Committee. Standardization (Normalisatie), Ernst Hijmans. Ingenieur, vol. 35, no. 24, June 12, 1920, pp. 411-429, 18 figs. Methods adopted by Netherlands Standard Committee in standardizing elemental parts of machines.

Safety Movement and. Standardization and the Safety Movement, Chas. E. Oakes and J. A. Dickinson. Am. Mach., vol. 53, no. 1, July 1, 1920, pp. 9-10. Examples offered to show need for standardization, such as standardization of safety codes for use of various states, municipalities and insurance companies.

Screw Threads. See SCREW THREADS, Standardization.

Trade Association Work in. Engineering in Trade Association Work, Wharton Clay. Jl. Western Soc. Engrs., vol. 25, no. 6, March 20, 1920, pp. 181-220. It is pointed out how trade associations may undertake engineering standardization in industries. Reference is made to difficulties experienced during the war by United States Government in dealing with industries in consequence of lack of standardization in manufacture of products. Trade associations, it is believed, can remedy this situation and thereby prepare the country for speedier mobilization of industry in case of war.

Water Supplies. See WATER SUPPLY, Standardization.

[See also ELECTRIC SYMBOLS; STANDARDS, Construction; TRANSFORMERS, Instrument.]

STANDARDS

Bolts. See BOLTS, Standards for.

End. Types of End Standards, R. L. Rankin. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1331-1332, 5 figs. Relative value of flat, cylindrical, spherical and other end standards.

Engineering, Canadian. The Canadian Engineering Standard Association. Can. Machy., vol. 22, no. 21, Nov. 20, 1919, pp. 508-509. Its purpose and method of work. A list of reports published by Association is appended.

German N. D. I. Reports. Report of the German Industry Committee on Standards (Mitteilungen des Normenausschusses der Deutschen Industrie). Betrieb, vol. 2, nos. 11, 12 and 13, May, June and July 1920, pp. 281-303, 329-343, and 345-358, 65 figs. May: Proposed standards for T-slots, dovetail slots, lubricating rings, hand and machine screw taps, hand plug taps, oil glasses, nut locks, flat hexagonal nuts, bolt heads for T and dovetail slots, and for conventions for drawings. June: Standards for wooden beams for small dwellings, and for wrench widths. Voltages for electric plants under 100 volts; flange couplings; knob screws and nuts, unit metric threads; rules for standards and formular values; and traversing wheels for hoisting machines with and without wheel flange. July: Proposed standards for cross-sections for shafts; shaft collars; machine handles; hollow set screws; flange bearings; standards and formular values; cast-iron pipe reducers and elbows.

Hose-Coupling Threads. See HOSE COUPLINGS, Threads, Standardization of.

Machine Parts and Details. See German N D I Reports.

Machine Screws. See BOLTS, Standards for.

Nuts. See BOLTS, Standards for.

Screw Threads. See German N D I Reports; SCREW THREADS, British Association; National Screw-Thread Commission.

Standard Shafts vs. Standard Holes. Standard Shafts vs. Standard Holes (Einheitswelle oder Einheitsbohrung). Werkstattstechnik, vol. 13, no. 22, Nov. 15, 1919, pp. 341-345. It is shown that standard boring in some parts of machine construction (transmission construction, etc.) cannot be successfully employed, whereas with standard shaft every construction problem, including the most complicated, can be solved. On the other hand, standard boring is said to offer so many advantages in certain cases that its use is recommended when confined to such construction work in which it can be employed advantageously. Report of Sub-Committee of Committee on Standards of the German Industry.

Taylor Society. Promulgation of Standards by the Taylor Society, William O. Lichtner. Bul. of Taylor Soc., vol. 5, no. 4, Aug. 1920, pp. 140-148 and (discussion) pp. 148-152. Suggests plan of procedure.

Tolerances. Standard Conditions and Specifications Adopted by La Commission permanente de Standardisation (Les cahiers des charges et règles d'unification adoptés par la Commission permanente de Standardisation). Métallurgie, vol. 51, nos. 46 and 47, Nov. 12 and 19, 1919, pp. 3110-3111 and 3175-3176. Tolerances permitted in manufacture of tools and instruments used in machine shop.

Tolerances and Allowances. See MACHINE CONSTRUCTION, Tolerances and Allowances.

STANDPIPES

Corrosion. Protecting Iron and Steel Standpipes from Corrosion, Charles W. Sherman. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 272-279 and (discussion) pp. 279-286, 2 figs. on two supp. plates. Based on replies to inquiries sent to waterworks in northern and eastern parts of United States where iron or steel standpipes are in use requesting information as to dates of painting, kind of paint used, preparation of surface for painting and other data.

Freezing of. Experiences with Ice in Standpipes,

Leonard Metcalf. Jl. Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 579-588. Encased, roofed and uncovered standpipes.

STAYBOLTS

Deflection. See LOCOMOTIVES, Fireboxes.

STEAM

Air in, Effect on Heat Transmission. The Effect of Air in Steam on the Coefficient of Heat Transmission, C. S. Robinson. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 644-646, 2 figs. Results of experiments at Massachusetts Institute of Technology. Empirical expression is formulated from results obtained.

Alignment Diagram. A Steam Alignment Diagram, D. Halton Thomson. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 301-305, 10 figs. Also in Power, vol. 51, no. 26, June 29, 1920, pp. 1045-1046, 1 fig. Based on equations for properties of steam propounded by Prof. H. L. Callendar.

Decomposition on Burning Coal. Decomposition of Steam on Burning Coal (Die Zersetzung von Wasserdampf an glühende Kohle), J. Gwosda. Feuerungstechnik, vol. 7, no. 23, Sept. 1, 1919, pp. 184-186. Results of experiments are said to show that in gas-firing regenerators the water-gas reaction has no appreciable influence on the oxidation of carbon monoxide by excess steam up to about 900 deg. temperature.

Exhaust. See EXHAUST STEAM.

Flow in Pipes. Charts for Graphical Determination of Pipe Sizes and Velocity of Flow of Steam, H. M. Brayton. Power, vol. 51, no. 19, May 11, 1920, pp. 762-763, 2 figs. Charts constructed from formula for quantity of steam which passes a given section of pipe in terms of diameter of pipe, and velocity of steam in pipe.

Flow of Steam Through Pipes and Fittings, M. C. Stuart and M. H. Russell. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 472-480, 5 figs. Charts constructed from Carpenter formula.

High-Pressure. What the Adoption of Higher Steam Pressures Will Mean, F. R. Parsons. Electrician, vol. 84, no. 2172, Jan. 2, 1920, pp. 7-8. How changes must be introduced in system of cylinder lubrication and other present practices if steam pressures are increased to 500 or 600 lb. per sq. in.

Properties of. See Alignment Diagram.

Separators. See SEPARATORS, Steam.

Superheated. See SUPERHEATED STEAM.

Textile-Mill Uses. See TEXTILE MILLS, Use of Steam in.

STEAM-ELECTRIC PLANTS

Coal Mines. Generating Plant at the Mouth of Mine, G. G. Bell. Elec. World, vol. 76, no. 13, Sept. 25, 1920, pp. 625-629, 6 figs. New Springdale plant of West Penn Power Co. Ultimate capacity will be 300,000 kw. Details of two turbo-generators of 25,000 kw. each being installed.

General Electric Co. Features of the New Steam Power Plant at the Erie Works of the General Electric Company, A. R. Smith. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 907-913, 4 figs. Coal and ash handling facilities, lighting and ventilation, steam distribution, cable distribution and power distribution.

Kansas City, Mo. New Northeast Station at Kansas City. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 450-456, 13 figs. Plans called for ultimate capacity of 270,000 kw. Plan is featured by combination high- and low-pressure economizers, submerged ashpits, vertical condensers with hydraulic vacuum nozzles, a ring bus system and other features on the electrical end.

Maintenance Costs. Analyzing Maintenance Costs. Elec. World, vol. 76, no. 13, Sept. 25, 1920, pp. 613-615, 7 figs. Comparison of monthly output, steam and electrical equipment repair costs in plant of 63,000 kva.

Pennsylvania. Springdale Power Station, West Penn Power Company, G. G. Bell. Power, vol. 52, no. 13, Sept. 28, 1920, pp. 488-496, 11 figs. Generating equipment consists of two 25,000-kva. turbo-generators. Eight double-end stokered boilers are arranged in two rows, each equipped with 13-retort stokers. Boilers are designed for 350-lb. pressure and will be operated at maximum of 250 to 300 per cent. Coal is delivered directly from company's mine to bunker in boiler house after passing through tipple where it is screened, picked and crushed.

Superstations. Economies to be Expected of Superstation, John A. Stevens. Power, vol. 51, no. 22, June 1, 1920, pp. 879-884, 7 figs. Deals with economies to be expected of superstations, including heat balance, power costs at switchboard, latest form of by-product steam turbines for producing heating and manufacturing steam and economies that are obtained by using them, and suggestions regarding placing of super-power stations in large industrial communities.

STEAM ENGINES

Clausius-Rankine Cycle. The Thermodynamic Cyclic Process for Investigation of Steam Engines (Die thermodynamischen Kreisprozesse zur Beurteilung von Kraftmaschinen), R. Plank. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 10, Mar. 6, 1920, pp. 221-227, 5 figs. Writer seeks to convince members of Assn. of German Engrs. that the thermodynamic cyclic process for a steam engine accepted by the Assn. as standard, and according to which no account is taken of total expansion, should be discarded and replaced by the Clausius-Rankine cycle, for which formulæ are presented.

Experimental. Experimental Engine at University College, Cardiff. Eng., vol. 109, no. 2836, May 7, 1920, pp. 612-614 and 616, 10 figs. Horizontal compound with cylinders arranged side by side.

Piston Valves. The Hochwald Piston Valve for Steam Engines (Kammerschieber, Bauert Hochwald, für Dampfmaschinen), M. Hochwald. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 42, Oct. 18, 1919, pp. 1032-1036, 11 figs. Describes piston valve with auxiliary passage which during compression strike is in connection with cylinder, thus increasing the compression space. Discusses with aid of diagrams the regulating effect of chamber on final compression pressure. Adaptability to stationary engines and locomotives is pointed out.

Reversing. An Auxiliary Steam Cylinder for Reversing Engines (Hilfsdampfzylinder für Umkehrmaschinen), F. Förster. Dinglers polytechnisches Jl., vol. 335, no. 1, Jan. 10, 1920, pp. 1-3, 4 figs. Description of a reversing apparatus of recent design without oil cataract cylinder for winding and rolling-mill engines, which is said to be simple and inexpensive and can be employed in older plants. Other uses of apparatus are referred to.

Robey Compound Superheater Engine. The Works of Messrs. Robey and Co., Limited, of Lincoln. Eng., vol. 110, no. 2847, July 23, 1920, pp. 104-106, 16 figs. partly on supp. plates. Details of Robey compound superheater engine.

Steam Consumption, Determination of. Determination of Steam Consumption by Means of a Vaporimeter (Dampfverbrauchfeststellung mit-

tels Vaporimeter). Kali, vol. 13, no. 22, Nov. 15, 1919, pp. 368-370. Description of an apparatus constructed and patented by Prof. Junkers, with which steam consumption of engines or turbines can be determined by measurement of the condensate, and which consists mainly of a surface condenser of a special design.

Uniflow. A Discussion of the Uniflow Steam Engine, Henry Pilling. Power House, vol. 13, nos. 11 and 12, June 5 and 21, 1920, pp. 257-260 and 276-278, 26 figs. June 5: Single-cylinder uniflow condensing engine claimed more economical than compound two-cylinder ones; especially suited for driving various mills. June 21: Principles of uniflow condensing engine and comparison of its steam consumption with that of other engines. Paper read before Manchester (England) Assn. Engrs.

The Uniflow Steam Engine, F. B. Perry. Eng., vol. 10, no. 2848, July 30, 1920, pp. 162-164, 6 figs. Principle of operation and details of construction. Paper read before Instn. Mech. Engrs.

Valve Gears. See VALVE GEARS.

Valves. See Piston Valves.

[See also LOCOMOBILES.]

STEAM GENERATORS

Electrically Operated. Electrically-Operated Steam Generators, E. G. Constam-Gull. Can. Engr., vol. 39, no. 7, Aug. 12, 1920, pp. 231-234, 4 figs. Results obtained in official tests of steam generators electrically operated which are being used in hydroelectric installation in Switzerland. High efficiency attained corresponds to evaporation of 2.9 lb. of so-called standard steam per kilowatt-hour. Steam produced had content of water of only about 3 per cent. compared with steam of 5 to 10 per cent humidity produced by ordinary fired boilers.

STEAM HEATING

See HEATING, STEAM.

STEAM HOSE

Manufacture. Construction of Steam Hose, John M. Bierer. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 6 pp. Also in India Rubber World, vol. 62, no. 5, Aug. 1, 1920, pp. 724-725 and Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 519-520. Three different experimental laboratories, working individually and independently, found consistent results in an effort to determine the relative values of seamless and plied tubes, and of simple duck and duck supplemented by braiding.

Specification. Standard Specification for Steam Hose. Power, vol. 52, no. 15, Oct. 12, 1920, p. 601. Specifications adopted by Am. Soc. for Testing Matls.

STEAM METERS

Types. The Metering of Steam. Times Eng. Supp., no. 541, Nov. 1919, p. 334. Methods and instruments.

See also CENTRAL STATIONS, Metering Practice.

STEAM PACKING

See PACKINGS, Steam and Hydraulic.

STEAM PIPES

Deflection. Deflection of Steam Pipes, H. M. Brayton. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 128-129, 1 fig. Formulæ and chart for rapid calculation.

Gate Valves for. See VALVES, Gate, Power-Operated.

Heat Losses. See HEAT LOSSES, Steam Pipes.

Stop Valves, Automatic. See VALVES, Stop, Automatic.

Superheated-Steam, Insulation of. Losses from Long Superheat Steam Pipes Determined by Means of Curves, Thomas G. Estep. Blast Furnace & Steel Plant, vol. 8, no. 4, Apr. 1920, pp. 259-261 and 263, 3 figs. Curves showing (1) most economical thickness of pipe covering for various temperature differences and heat costs, (2) total heat loss per 100 lineal feet of pipe in B.t.u. per hr. when covered with most economical thickness of pipe covering, and (3) temperature drop per 100 lineal feet of pipe when covered with most economical thickness of pipe covering.

Support of. Steam Pipe Support, H. M. Brayton. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1055-1058, 4 figs. Scientific determination of proper spacing of hangers. Charting of necessary working equations.

STEAM POWER PLANTS

Armour Co., St. Paul. New Armour South St. Paul Plant. Power, vol. 51, no. 2, Jan. 13, 1920, pp. 48-54, 12 figs. Plant supplies power, light, heat, hot water, compressed air and refrigeration to large packing house. High economy is said to be secured because exhaust steam requirements are practically balanced with exhaust steam produced.

Auxiliary Apparatus. Auxiliary Apparatus of the Steam Power Plant, T. H. Fenner. Power House, vol. 12, no. 17, Oct. 20, 1919, pp. 464-468. Illustrating various forms of conveyors, coal and ash handling equipment and automatic coal weighing hopper.

Electric Drive for Station Auxiliaries, E. E. George. Elec. World, vol. 75, no. 24, June 12, 1920, pp. 1365-1366. Motors operated with steam diverted from intermediate stage of turbines for feedwater heating are said to be more economical than steam-driven auxiliaries.

Cincinnati, Ohio. Construction of a Modern Power Generating Plant, F. D. Wyatt. Elec. Rev. (Chicago), vol. 77, no. 6, Aug. 7, 1920, pp. 199-202, 5 figs. Details of boiler- and turbine-room equipment, generating, distributing and control systems of West End station, Union Gas & Electric Co. Paper before Ohio Electric Light Assn.

Coal Consumption. The Coal Consumption of Power Plants, Robert H. Parsons. Elec. News, vol. 29, no. 3, Feb. 1, 1920, pp. 31-34, 4 figs. Outlines graphic method of keeping continuous check upon efficiency of plant and suggests criterion by which performance of plant may be judged irrespective of load it may be carrying.

Coal Handling. See COAL HANDLING, Locomotive Cranes.

Connecticut. Eastern Connecticut Served by New Station, E. T. Phillips. Elec. World, vol. 75, no. 10, Mar. 6, 1920, pp. 533-535, 7 figs. Two horizontal Curtis steam turbines rated at 10,000 kw. (continuous) and 1800 r.p.m. drive 12,500-kva., three-phase, 60-cycle, 11,000-volt generators.

Cooling Towers. See COOLING TOWERS.

Cooling-Water Equipment. Construction of a Cooling-Water Plant at the Mayence Electric Plant (Der Neubau einer Kühlwasseranlage beim Elektrizitätswerk Mainz), Hans Schäfer. Beton u. Eisen, vol. 18, nos. 17-18, Nov. 8, 1919, pp. 190-194, 15 figs. Details and illustrations of intake construction, water purification plant, distributing chamber, inlet and outlet channels, suction and discharge conduits, etc.

Cost Data, Records of. Planning Records of Cost Data. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 8-19, 20 figs. Recommends vari-

ous forms of records and means and systems for collection of data.

Costs. Power Costs During Years 1914 to 1919, Hubert E. Collins. Indus. Management, vol. 59, no. 6, June 1920, pp. 467-472, 1 fig. Summary of records of 14 representative plants. Conditions that prevailed in plants are surveyed, noting changes in power costs that took place during the years of the war. Tables of costs of heating industrial buildings, distribution of power consumption between various departments of industrial plants, and costs of softening boiler feed water using lime and soda ash, are given.

Design. Power Station Design in Relation to Thermal Efficiency, I. V. Robinson. Engr., vol. 129, no. 3365, June 25, 1920, pp. 655-656. Developments in power-station design leading to greater thermal efficiency are classified into (1) increase in range of working temperatures of steam, (2) saving of low-grade heat, and (3) increase in size of generating sets. Paper read before Incorporated Municipal Elec. Assn. Convention.

Economy Through Superheating. See SUPERHEAT, Advantages of.

Future Development. Review of Steam Power Plant Improvement, F. E. Kling. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 68-70. Writer sees tendency towards higher efficiency in utilization of fuel, utilization of waste heat and waste combustibles, application of labor-saving devices and tendency towards more rugged design of machinery and apparatus to insure continuity and decrease cost of repairs.

High Steam Pressures. The Year's Progress in the Power Field. Power, vol. 51, no. 1, Jan. 6, 1920, pp. 2-16, 19 figs. It is said period has been noted by the fact that "high pressures of yesterday are now standard, and a higher goal has been set." It is visualized that "at no distant date the present maximum of 350 lb. gage coupled to a temperature approximating 650 deg. fahr. should be exceeded, with current practice following and slowly closing up the gap."

Interheating. Calculations Relating to High-Pressure and High Temperature Steam with Interheating for Power Generation, W. M. Selvey. Elecn., vol. 83, no. 2166, Nov. 21, 1919, pp. 585-587, 3 figs. With graphs illustrating effects on efficiency of pressure at which one interheating is made in expanding from 500 lb. (abs.) to vacuum.

Modern Type. McKeesport Tin Plate Company Operates Modern Steam Power Plant. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 64-68, 6 figs. Details of coal storage and coal-handling, facilities, stokers, superheaters, ash-handling machinery, and feedwater treatment.

Municipal Brewery, Munich. The New Steam Plant of the Municipal Brewery in Münich (Die neue Dampfanlage des Bürgerlichen Bräuhauses in München), Ludwig Schneider. Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, no. 1, Jan. 15, 1920, pp. 3-6, 5 figs. Describes, among other features, the 500-hp. horizontal tandem compound steam engine constructed by J. A. Maffei in 1914, which is operated with superheated steam of 14 to 15 atmos. initial excess pressure and 300 deg. cent. temperature.

Operating Log Sheets. Planning Operating Log Sheets. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 34-43, 16 figs. Suggested procedure for studying operating conditions of power plant with object of reducing costs.

Reconstruction. Reconstruction of a Power Plant Under Operation, Thorleif Fliflet. Power, vol. 52, no. 3, July 20, 1920, pp. 82-84, 3 figs. Power production is said to have maintained at normal in plant of Surpass Leather Co., Philadelphia, Pa., over entire period during which battery of seven old return-tubular boilers was replaced, two at a time, by three water-tube stoker-fired boilers.

Records. Power Plant Records and Analysis. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 2-3, 1 fig. Classification of records.

Shipyards. Ten-Thousand Horsepower Station for Operating Shipyard, Julius G. Berger. Power, vol. 52, no. 8, Aug. 24, 1920, pp. 284-289, 8 figs. Combined 5000-kva. turbo-alternator and 4500-hp. air-compressor plant. New plant built around old station while latter was kept in operation. Steam header 590 ft. long and main air line 2315 ft. long has butt-welded connections. Acceptance test data and performance are given.

Statistics for Comparison. Essential Statistics for General Comparison of Steam Power Plant Performance, W. S. Gorsuch. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 132-134. Method for comparing efficiencies between different plants without going into detailed study of thermal characteristics of plants or introducing power costs. Essential items of steam-power plant performance that should be recorded and uniform method of expressing them are given in tabulated form, with illustration demonstrating advantage of proposed method.

Superheated Steam, Use in. See SUPERHEATED STEAM, Use in Power Plants.

Tests. Analysis of Tests. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 50-55, 4 figs. Methods of comparing data obtained in tests of power-plant equipment.

Steam Power Plant Tests, H. L. Doolittle. Jl. of Electricity, vol. 45, nos. 3 and 4, Aug. 1 and 15, 1920, pp. 130-132 and 182-183, 6 figs. Aug. 1: Data on fuel oil economics obtained from extended steam power plant tests. Aug. 15: Charts showing results of simultaneous readings of pressures on steam and oil headers and also pressures of steam and oil at burner.

Western States, Tendencies in Design. Steam-Electric Generation in Far West, W. F. Durand and C. H. Delany. Elec. World, vol. 75, no. 20, May 15, 1920, pp. 1123-1127, 10 figs. Survey of present tendency of design. Leaning is said to be toward higher superheat, centrifugal-pump auxiliaries, automatic control and use of recording meters in boiler room.

[See also BOILER PLANTS; BOILER ROOMS; ECONOMIZERS; STEAM-ELECTRIC PLANTS.]

STEAM REGENERATORS

Requirements of. Steam Regenerators Reduce Coal Consumption, W. H. Schacht. Min. & Metallurgy, no. 164, Aug. 1920, pp. 32-33. Method for regulating regenerator requirements. (Abstract.)

STEAM SHOVELS

Quarry Tracks. Track Layouts in Limestone Quarries for Steam Shovels, Daniel J. Hauer. Cement, Mill & Quarry, vol. 15, no. 9, Nov. 5, 1919, pp. 13-15, 6 figs. Suggested arrangements to comply with various conditions, such as providing continuous passage of cars, operating several shovels with side tracks, etc.

See also TRENCH EXCAVATION, Steam Shovel.

STEAM TURBINES

Balancing. Levelling Micrometer for Testing the Balancing of Turbines. Eng., vol. 110, no. 2850, Aug. 13, 1920, p. 210, 2 figs. Designed and manufactured by Cambridge and Paul Instrument Co., Ltd., of Cambridge, London.

See also BALANCING, Turbines and Propellers.

Blades, Efficiency of. Efficiency of Steam Turbine Blades (Considérations sur le rendement des aubages des turbines à vapeur), P. Nys. Annales de l'Association des Ingénieurs sortis des Écoles spéciales de Gand, vol. 8, only no. 1914-1918, pp. 1-46, 29 figs. Efficiency is computed for system composed of Curtis wheel and Rateau multicellular turbine.

Brush-Ljungström. The Brush-Ljungström Steam Turbine. Practical Engr., vol. 62, no. 1753, Sept. 30, 1920, pp. 214-216, 3 figs. Set consists of cylindrical case, placed horizontally, turbine occupying remarkably small space and located between two generators. Turbine is of reaction type and has two rotors revolving in opposite directions, whereby actual running speed is practically doubled.

Calculations. The Application of the v^2-Method in the Calculation of Steam Turbines (Ueber die Verwendung der v^2-Methode bei der Berechnung von Dampfturbinen), R. Fichtner. Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 9, Mar. 20, 1920, pp. 97-100, 6 figs. In the usual v^2-method with charging of the v^2 against the heat content, a change is made by charging against the adiabatic drop and use of velocity coefficients; it is shown by examples that both methods agree fundamentally and differ only in velocity of efflux.

Centrifugal Testing Plants. Centrifugal Testing Plants for High-Speed Machine Parts (Schleuderanlagen für rasch umlaufende Maschinenteile). Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 35, Dec. 20, 1919, pp. 383-384, 2 figs. Description and illustrations of two centrifugal testing pits in the works of the Brown Boveri Co., Baden, for horizontal and vertical turbine and blower rotors.

Critical Speeds. The Theory of Critical Speeds (Zur Theorie der kritischen Drehzahlen), A. Stodola. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 1 and 2, Jan. 10 and 20, 1920, pp. 1-5 and 18-22, 9 figs. Supplementary notes to author's article on New Critical Speeds as a Result of the Gyroscopic Action of Rotors, published in same journal (1918, p. 253). Reference is made to work by Klein and Sommerfeld, describing gyroscopic action on the Delaval shaft, but only with regard to the steady precession, whereas in this article the countermovement of this action is particularly discussed. Results of various experiments are given.

Curtis, Speed and Power of. Speed and Power of Curtis Steam Turbine, Eskil Berg. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 163-165, 6 figs. Considerations regarding design of single-shaft Curtis steam turbines showing that under stated conditions turbine can have its most economical point at 21,000 kw.

Extraction. Steam Turbines for the Delivery of Low-Pressure Steam (Die Dampfturbine für die Abgabe von Niederdruckdampf), H. Baer. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 1, 2, 3, 4 and 5, Jan. 10, 20, 30, Feb. 10 and 20, 1920, pp. 5-8, 13-18, 25-29, 37-41 and 52-56, 32 figs. Description and schematic presentation of the two methods of delivering heating steam from a steam turbine, namely, removal of total amount of steam after part of its heat content has been transformed into mechanical energy in roters of turbine, or part of steam traversing turbine from an intermediate stage. Notes on thermodynamic relations; turbine and piston engines, with tabular data showing results of experiments on back-pressure and extraction turbines, etc., details and illustrations of various types of turbines of the German Gen. Elec. Co., the Zölly Syndicate, etc.

Flow in. See FLOW OF GASES, Nozzles and Turbine Buckets.

Geared, Lubricating System for. Lubricating System for Geared Turbines, J. Emile Schmeltzer and B. G. Fernald. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 508-510, 1 fig. Standard oiling system developed by Emergency Fleet Corporation for adoption on vessels equipped with geared turbines. Paper read before Soc. of Nav. Architects and Mar. Engrs.

Governors. Isodrome Governors (Ueber Isodrom-Regler), H. Kröner. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 28, July 1, 1920, pp. 529-531, 11 figs. Describes device, use of which in connection with direct- and indirect-acting engine governors, permits the elimination of the otherwise necessary speed difference between full load and no load. Use of isodrome governors for various types of steam turbines is discussed.

Steam-Turbine Governors. Power, vol. 51, nos. 7, 9 and 11, Feb. 17, Mar. 2 and 16, 1920, pp. 254-256, 328-329 and 414-419, 21 figs. Describes shaft governor, emergency governor and governor valves used on Terry turbine. Curtis direct-type governor, its care and adjustments, with directions for putting in a new spindle and for testing emergency stop. Governors of 75- to 3000-kw. Curtis turbines, discussing single and double-deck inertia governors used on Curtis horizontal turbines of moderate capacities.

Ljungström. Construction of The Ljungström Steam Turbine. Mar. Eng. & Can. Merchant Service Guild Rev., vol. 9, no. 10, Oct. 1919, pp. 331-334, 2 figs. Turbine permits radial flow of steam through blades from shaft outwards.

See also Brush-Ljungström.

Low-Pressure. Steam Turbines for the Delivery of Low-Pressure Steam (Die Dampfturbine für die Abgabe von Niederdruckdampf), H. Baer. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 6, 7 and 8, Feb. 29, Mar. 10 and 20, 1920, pp. 65-68, 73-76 and 85-86, 26 figs. Describes back-pressure and supply turbines of Görlitzer Machine Construction Plant and the Escher, Wyss & Co., equipped solely with single-rim wheels; those of Brown, Boveri & Co., developed mainly from the standard condensing turbines of same firm; and the Franco Tosi turbines, consisting usually of 2-rimmed wheels and developed also from their condensing turbines.

Lubrication. Steam-Turbine Lubrication, W. F. Osborne. Power, vol. 51, no. 9, Mar. 2, 1920, pp. 322-324, 1 fig. Discusses lubrication problems presented by high speeds and high bearing temperatures met with in steam turbines; layout and operation requirements of oil-circulating systems; extra problems involved when reduction gearing is used; description and viscosities of oils for various conditions of turbine work.

The Causes of Trouble in Steam-Turbine Lubrication and the Remedy, L. E. Strothman. Power, vol. 52, no. 7, Aug. 17, 1920, pp. 244-246, 2 figs. Steps in development of improved systems are traced and their faults and virtues discussed.

Machine-Shop Drive. Steam Turbines for Mechanical-Drive, Ivan Stewart Forde. Elec. Jl., vol. 17, no. 4, Apr. 1920, pp. 136-139, 6 figs. Single wheel type is said to offer best possibilities for both simplicity and reliability, enabling manufacturer to eliminate complications of long shaft, diaphragms and packing between wheels or stages of multistage type.

Marine. See MARINE STEAM TURBINES.

Mixed-Pressure. Steam Turbines with Added Steam (Dampfturbinen mit Zusatzdampf), Her-

bert Melan. Zeitschrift für das gesamte Turbinenwesen, vol. 16, nos. 33, 34 and 35, Nov. 30, Dec. 10 and 20, 1919, pp. 356-359, 365-369 and 379-383, 12 figs. Deals with auxiliary turbines and the utilization of their exhaust in the main turbine, auxiliary nozzles and connection lines; influence of added steam volume on steam consumption of a large turbine and on its efficiency; standard-pressure and reaction turbines. Formulæ are presented which can be graphically handled.

Nozzles. See NOZZLES, De Laval.

Operation and Adjustment. Operation and Adjustment of Turbine Machinery, Eustis H. Thompson. Power, nos. 1, 3, 5, 8 and 10, July 6, 20, Aug. 3, 24 and Sept. 7, 1920, pp. 2-4, 85-87, 181-183, 297-298 and 389-390, 23 figs. Leveling of turbines, assembly of casing, and aligning of bearing pedestals. Inspecting machine before setting it in motion. Examining and starting large turbines after erection. Troubles encountered in operation of turbine machinery are discussed, such as accumulation of coat of scale on blades, loss of balance of machine, shaft packing, etc.

Reduction Gears. See REDUCTION GEARS.

Rotors. The Calculation of Rapidly Revolving Disks (Beitrag zur Berechnung rasch umlaufender Scheiben), Friedr. Beyer. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 10, 11 and 12, Apr. 10, 20 and 30, 1920, pp. 112-117, 121-125 and 133-136, 20 figs. Describes accident in which a rapidly revolving steam turbine rotor was fractured and gives resulting calculation of rotor for investigation of cause of fracture; advantages and disadvantages of Donath's method are pointed out, and, based thereon a new calculating method is developed and applied to the investigation of the fractured rotor.

The Calculation of Shrunken Disks (Die Berechnung aufgeschrumpfter Radscheiben), A. Saling. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 13 and 14, May 10 and 20, 1920, pp. 150-153 and 162-164, 5 figs. With the use of formulas for disks of uniform thickness, a method is given for the calculation of pressures due to shrinkage in disks with any given profile. The general relationship between tension and speed of rotating disk is derived as parabolic law, and with the aid of a numerical example, tension parabolas for shrunken disks and shafts at equal or unequal temperature distribution are determined.

70,000-Kw. Unit. Year's Achievements of Westinghouse Company. Elec. Rev. (Chicago), vol. 76, no. 1, Jan. 3, 1920, pp. 28-32, 3 figs. Notable installation is said to be the 70,000-kw., 25-cycle, 3-element, cross-compound unit at station of N. Y. C. Rapid Transit Co. Number of important changes made during 1919, it is claimed, in Westinghouse underfeed stoker.

75,000-Hp. 75,000 hp. Steam Turbine, H. Baer. Eng. Progress, vol. 1, no. 1, Jan. 1920, pp. 9-11, 5 figs. Turbine and generator are designed for output of 60,000 kva. at 1000 r.p.m. Steam pressure amounts to 170 lb. per sq. in. and steam temperature to 325 deg. cent.

Speed and Power Limits. Present Limit of Speed and Power of Single Shaft Curtis Steam Turbines, Eskil Berg. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1223-1231, 6 figs. It is shown that limit of single-unit turbogenerator is confined to steam turbine and that last wheel of turbine is limiting feature. Accordingly last wheel of an 1800 r.p.m. turbine is taken up.

Present Limits of Speed and Power of Single-Shaft Steam Turbines, J. F. Johnson. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1243-1263, 6 figs., partly on supp. plate. Discussion of factors which influence limits as applying particularly to turbines of reaction type. When high vacua are employed, limit of power is said to be determined by area obtainable through last stage.

Steam-Control Device. A Simple Low Pressure Steam Control Device, J. W. Smith. Soc. Engrs. Jl. & Trans., vol. 11, no. 6, 1920, pp. 157-164, 2 figs. Device constructed for removing troubles arising from fluctuations in supply of exhaust steam in British Westinghouse mixed-pressure steam turbine, which as supplied by makers have no provision for automatically cutting off last expansion stage of turbine from exhaust main, when supply of exhaust steam failed.

Tandem Compound. New Unit in Fisk Street Station, F. A. Hatch. Power Plant Eng., vol. 24, no. 10, May 15, 1920, pp. 507-509, 3 figs. Twenty-five cycle, 35,000-kw. tandem-compound steam-turbine unit recently put into operation at Fisk Street Station of Commonwealth Edison Co., Chicago.

Testing. The Willans Line, Alexander Jude. Engr., vol. 129, no. 3361, May 28, 1920, pp. 545-547, 4 figs. Consumption characteristics of steam turbines.

Theory of. Theory of the Steam Turbine with Special Consideration of Recent Experimental Results (Beiträge zur Dampfturbinentheorie mit besonderer Berücksichtigung neuerer Versuchsergebnisse), Herbert Melan. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 18 and 19, June 30 and July 10, 1920, pp. 205-208 and 221-225, 12 figs. Discussion of present status of the theory of the "mixed construction" type of turbine, based on author's investigation of a 5000-kw. turbine of the Budapest central station.

[See also COAL MINES, Exhaust-Steam Utilization.]

STEAMERS

See SHIPS.

STEAMSHIPS

See SHIPS.

STEEL

Acid Electric-Furnace. Notes on the Acid Electric Furnace Process, L. B. Lindemuth. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 595-596. From point of view of inclusions resulting from process basic electric process is said to give conditions which are more favorable for reducing inclusions to a minimum, than acid process. Paper read before Am. Foundrymen's Assn.

Acid Open-Hearth. Making Acid Open-Hearth Steel, B. E. L. de Mare. Iron Trade Rev., vol. 66, no. 23, June 3, 1920, pp. 1607-1610, 3 figs. It is said that acid steel is unusually free from oxides and therefore is adapted to projectiles, gun forgings, turbine forgings, etc. History of typical heat is traced and analyses discussed. Paper read before Am. Iron and Steel Inst.

Alloy. See ALLOY STEELS.

Analysis. On the Estimation of Carbide Carbon in Steel, Katsumi Inouye. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 6, March 30, 1920, pp. 145-154, 6 figs. partly on 2 supp. plates. Experimental. It was found that proportion of carbide carbon increases with rate of cooling, the more slowly the steel cooled below Ar_1 the greater being the amount. Thus it was determined that steel in sorbytic structure had 0.51 per cent carbide carbon, in pearlitic 0.71 per cent. and in spheroidized state 0.80 per cent approximately.

Arsenic in, Effect of. Effect of Arsenic in Steel, P. E. McKinney. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, p. 294. Static

testing disclosed that 0.3 arsenic is not injurious. It is observed, however, that arsenic is extremely hard to get rid of after it is once present in steel and that if steel used for scrap purposes after its usefulness has ceased, there is a constant automatic augmentation of arsenic content which will in time get beyond limits desired.

Arc-Fused. Physical Properties of Arc-Fused Steel, Henry S. Rawdon, Edward C. Groesbeck and Louis Jordan. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 677-684, 8 figs. Tests cut from blocks of arc-fused metal gave mechanical properties like inferior, porous casting, notably deficient in ductility, and determined entirely by unsoundness in structure. Carbon, silicon and other elements were lost from welding pencil during decomposition.

Automobile Steels. The Institution of Automobile Engineers, Leslie Aitchison. Automobile Engr., vol. 10, no. 135, Feb. 1920, pp. 71-75 and (discussion) pp. 75-76. Fundamental properties required by automobile steels are enumerated and automobile steels are classified into groups according to number of these properties they possess.

Bar, Weight of. Chart for Screw Machine Stock. Machy. (Lond.), vol. 16, no. 415, Sept. 9, 1920, pp. 713-714, 1 fig. Chart for determining weight of brass or steel bar stock.

See also CHARTS, Weight of Round Bars.

Bessemer, Acid and Basic. Metallurgical Occurrences in Connection with Acid and Basic Bessemer Processes Based on Spectrum-Analysis Observations (Die metallurgischen Vorgänge beim sauren und basischen Windfrischverfahren auf Grund spektralanalytischer Beobachtungen), L. C. Glaser. Stahl u. Eisen, vol. 40, no. 4, Jan. 22, 1920, pp. 111-117, 18 figs. Writer describes and compares American, English, German and Swedish processes. Results of practical tests are given.

Boiler Plate. See BOILER PLATE.

Case-Hardening. See CASE-HARDENING.

Case-Hardening Quality. See CASE-HARDENING, Steel for.

Cast, Macrostructure of. Studies of the Macrostructure of Cast Steel, Fred G. Allison and Martin M. Rock. Chem. & Metallurgical Eng., vol. 23, no. 9, Sept. 1, 1920, pp. 383-389, 25 figs. Procedure is outlined for development and record of macrostructure. It is observed that symmetrical arrangement of dendrites is necessary for consistent physical tests, and it is pointed out that pouring cold metal suppresses dendrites.

Cast, Properties of. See FOUNDRIES, Steel.

Casting and Treatment of. Casting and Treatment of Steel, J. H. Andrew. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 7, May 1920, pp. 355-380, 27 figs. Points out that experiments lend strong support to view that phosphorus, or its absence, is cause of bad or good impact value. Failures in high-speed steel are said to be due to three main causes, (1) hardening cracks due to bad manipulation; (2) overheating and burning in final hardening; and (3) laminations of iron tungstide. Photomicrographs.

Castings. See STEEL CASTINGS.

Chemical Properties. See Physical Properties.

Chrome. See CHROME STEEL.

Chrome-Nickel. See CHROME-NICKEL STEEL.

Chromium. See CHROME STEEL.

Chromium-Molybdenum. See CHROME STEEL, Chromium-Molybdenum.

Classification. Materials for Mass Production, E. A. Allcut. Eng. & Indus. Management, vol. 2, no. 20, Nov. 13, 1919, pp. 616-617. Concerning separation of different classes of steel by subjecting every specimen to Brinell test.

Cold Rolling. Stresses Caused by Cold Rolling, Henry M. Howe and Edward C. Groesbeck. Dept. of Commerce, Bureau of Standards, Technologic Papers, no. 163, May 18, 1920, 8 pp., 6 figs. Also in Metal Industry (N. Y.), vol. 18, no. 8, Aug. 1920, pp. 353-354, 6 figs. Increase of internal stress with amount of reduction per pass, when thickness of pair of strips is reduced by cold rolling, is ascribed to skin friction of rolls. Degrees of rate of deflection as rolling progresses is explained by progressive increase of stiffness of strips enabling them to resist better bending fact of skin friction. Paper read before Am. Soc. for Testing Matls.

Cold Working of. Results of Cold Working in the Manufacture of Hydrogen Bottles (Folgen der Kaltbearbeitung von Wasserstoffflaschen), Ernst Rock. Stahl u. Eisen, vol. 39, no. 48, Nov. 27, 1919, pp. 1467-1470, 6 figs. In 1918 a bottle containing hydrogen exploded at the Schwarzenberg Hydrogen and Oxygen Works in Saxony, causing the destruction of welding room and loss of 17 lives. Results of investigation of broken pieces are said to prove that tensile strength was sufficient, but high degree of brittleness was shown, which, it is claimed, was result of the cold-drawing of material in bottle.

Corrosion. See IRON, Corrosion.

Critical Points. Practical Determination of the Critical Points of Steels by the Differential Method (Sur la détermination pratique des points critiques de aciers par la méthode differentielle), A. Portevin and V. Bernard. Revue de Métallurgie, vol. 16, no. 3, May-June 1919, pp. 175-192, 15 figs. Experience of writers in application of Roberts Austen's differential method. Substitution of Chevenard differential expansimeter in place of Saladin-Le Chatelier double galvanometer has been found by them to increase considerably accuracy of method.

Deoxidation with Hydrogen. Experiments on the Deoxidation of Steel with Hydrogen, J. H. Whiteley. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 13, 14 pp., 13 figs. Two series of experiments were made, first with small sections and second with strips 1/400 in. thick. Experiments all showed that oxide is removed very slowly below 950 deg. cent.; as temperature is raised speed increased, but not until 1300 deg. cent. was used did thin strips appear to be completely deoxidized in one hour.

Elastic Strengths. The Relation Between the Elastic Strengths of Steel in Tension, Compression and Shear, Fred B. Seely and William J. Putnam. University of Illinois Bul., vol. 17, no. 11, Nov. 10, 1919, 49 pp., 9 figs. Results of experiments with soft, mild and medium carbon steel, and vanadium, nickel and chrome-nickel alloy steel. It is concluded in part that correct value of elastic shearing strength of steel as measured by proportional limit or useful limit point is from 0.55 to 0.65 of elastic tensile strength, thus disproving maximum shear theory of failure of elastic action of tensile steel, sometimes called Guest's law, which assumes that elastic shearing strength is 0.5 of elastic tensile strength.

Electric vs. Converter. Electric Versus Converter Steel, J. H. Hall and G. R. Hanks. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 115-116. Experiments are said to have established that electric steel is superior to converter steel from standpoint of hot checks. Paper read before American Foundrymen's Assn.

Export Trade. See EXPORT TRADE, Steel.

Ferrite in. Genesis of Ferrite, Federico Giolitti. Chem. & Metallurgical Eng., vol. 22, no. 16,

Apr. 21, 1920, pp. 737-739, 10 figs. Writer claims that, contrary to commonly accepted ideas, ferrite in hypo-eutectoid steels is not extruded as a shell to outside of austenitic kernels, but exists as an aggregation of crystals essentially discontinuous and originating at low-carbon nuclei of solid solution grains.

Forged, Defects in. See FORGINGS, Defective.

Forged vs. Rolled Bars. Rolled and Forged Steel Bars, J. H. Higgins. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, Mar. 1920, pp. 295-298, 12 figs. Results of investigations conducted at works of Camden Forge Co., in which forged bars were found to give better results in natural, annealed and heat-treated state, both physically and micrographically.

Fracture. Intercrystalline Fracture in Mild Steel, Walter Rosenhain and D. Hanson. Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 421-422, 9 figs. Systematic observations have led writers to formulate theory that fracture of mild steel occurs mainly by breaking across of ferrite crystals and not by separation of one crystal from another. Paper read before Iron & Steel Inst.

Oblique Fracture and Segregations (Schieferbruch und Seigerungserscheinungen), P. Oberhoffer. Stahl u. Eisen, vol. 40, nos. 21 and 26, May 27 and June 30, 1920, pp. 705-713 and 872-878, 33 figs., 23 on supp. plates. Origin of the relationship between oblique fracture and phosphorus etching is explained with aid of microscopic investigations and causes for enrichment are pointed out; distinction is made between crystal, ingot and blister segregations and causes for each are described, but oblique fractures are said to be due only to blister segregations. Photomicrographs.

Galvanized, Strength of. Metallographical Study on Galvanized Steel, Y. Taji. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 327-329, 19 figs. Results of experiments. Of special interest were values found for alternating strength of steel bar both before and after galvanization, which were 25.2 and 24 tons per sq. in. respectively. Paper read before Soc. of Naval Architects, Japan.

Gear. Gear Steels, J. H. Parker. Machy. (Lond.), vol. 15, no. 369, Oct. 23, 1919, pp. 113-115. Kind of steel used in gears for automobile service and materials for commercial or jobbing gears; chemical and physical properties and heat treatment. Paper read before Am. Gear Manufacturers' Assn.

Hardening. See FORGINGS, Electric Heat Treatment; SPRINGS, Automobile; STEEL, HEAT TREATMENT OF, Hardening.

Hardness Testing. Note on Brinell and Scratch Tests for Hardened Steel, Robert A. Hadfield and S. A. Main. J. Instn. Mech. Engrs., no. 7, Oct. 1919, 581-586, 3 figs. Experiments comparing these two methods of testing. Empirical formula establishing their relationship is developed.

Heat Treatment. See STEEL, HEAT TREATMENT OF.

High-Carbon, Welding. Difficulties in Welding High-Carbon Steel, G. H. Higgens. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 387-388, 3 figs. It is shown that welding high-carbon steel tends to weaken part welded. Photomicrographs are presented illustrating actual structure of spring steel and patch after operation.

High-Speed. See STEEL, HIGH-SPEED.

Industry. See STEEL INDUSTRY.

Ingot Tests. Tests Sink-Head Ingots. Iron Trade Rev., vol. 67, no. 2, July 8, 1920, pp. 114-116, 4 figs. Bureau of Standards' experiments at Maryland Steel Co. plant. Ingots from English plant compared favorably with steel cast by ordinary practice for rails.

Ingots, Cooling of. Macrographic Study of the Propagation of Cooling in the Interior of a Steel Ingot from the Time of its Solidification (Sur l'étude macrographique de la propagation du refroidissement à l'interieur d'un lingot d'acier à partir de sa solidification), MM. Descolas and Prétet. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 18, May 3, 1920, pp. 1048-1051, 2 figs. Experiences are related in which writer succeeded in obtaining in ingots by treating them with solution of sulphuric acid lines formed of brilliant points. It is interpreted that these lines corresponded with isothermal surfaces during cooling.

Japanese Industry. See IRON AND STEEL, Japanese Industry.

Lead Plating of. See ELECTROPLATING, Lead on Steel.

Liquid, Temperature Measurement. See TEMPERATURE MEASUREMENT, Liquid Steel.

Literature for 1919. Review of Iron and Steel Literature for 1919, E. H. McClelland. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 8-10. Classified list of books, serials and trade publications.

Macrostructure. Revealing Macrostructure of Iron and Steel, Henry S. Rawdon. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 965-968, 7 figs. Method of etching with ammonium persulphate as agent.

Magnet. British Standard Rolled Sections for Magnet Steel. British Eng. Standards Assn., no. 107, Oct. 1919, 6 pp., 2 figs. Table is included giving dimensions of rolled steel sections for permanent magnets for the ignition magnetos.

Iron and Steel for Electrical Purposes, Frank P. Fahy. Jl. Am. Steel Treaters Soc., vol. 2, no. 2, Nov. 1919, pp. 74-87, 4 figs. Points out fields of usefulness of each grade of magnetic material and source of common variations in magnetic quality.

Magnetic Properties. The Variation of Residual Induction and Coercive Force with Magnetizing Force, R. L. Sanford and W. L. Cheney. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 384, June 23, 1920, pp. 291-298, 6 figs. Graphs and tables giving magnetic properties of steels of various compositions.

Manganese. See MANGANESE, STEEL.

Manufacture. See STEEL MANUFACTURE.

Melting. See ELECTRICAL FURNACES, Steel Foundry.

Microstructure of. Microstructure of Iron and Mild Steel at High Temperatures, Henry S. Rawdon. Min. & Metallurgy, no. 158, Section 18, Feb. 1920, 20 pp., 13 figs. Experimental investigation of surface layer during heating in vacuo, and of formation of surface pattern under "heat-relief" etching.

Mills. See STEEL WORKS.

Molten, Temperature Measurement. Measuring Temperature of Molten Steel, F. W. Brooks. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 597-599, 1 fig. See also Foundry, vol. 48, no. 5, Mar. 1, 1920, pp. 197-198, 1 fig. Use of thermocouples, radiation and optical pyrometers in measuring molten steel temperature. Explanation of film, rod and pouring tests. Temperature at which steel leaves furnace. Paper read before Am. Foundrymen's Assn.

Molybdenum. See MOLYBDENUM STEEL.

Nickel. See NICKEL STEEL.

Nickel-Copper. See NICKEL-COPPER STEEL.

Nitrogen in. Nitrogen in Steel, and the Erosion of Guns, H. E. Wheeler. Min. & Metallurgy, no. 160, April 1920, p. 32. Experiments conducted at testing laboratory of Watertown Arsenal.

The Effect of Nitrogen on Steel, George F. Comstock and W. E. Ruder. Chem. & Met. Eng., vol. 22, no. 9, Mar. 3, 1920, pp. 399-405, 13 figs. Résumé of important literature on amount of nitrogen in various classes of steels, its method of occurrence and effect on physical properties, together with some recent experiments on its action during heat treatment.

Non-Magnetic. Non-Magnetic, Flame, Acid, and Rust Resisting Steel, C. M. Johnson. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 423-424. Properties of steel developed in Research Dept., Crucible Steel Co. of America.

Non-Metallic Inclusions, Effect of. Effect of Non-Metallic Inclusions Upon the Properties of Steel and Iron, E. G. Mabin. Proc. Steel Treating Research Soc., vol. 2, no. 9, 1920, pp. 14-21 and 34-36, 44 figs. Tests are said not to have confirmed Stead's theory in regard to statement that inclusions are not responsible in any way for ferrite segregation and that such segregation is entirely due to presence of iron phosphide dissolved in regions surrounding inclusions; but work of study which established that persistence of ferrite-pearlite banding of forged steel through ordinary thermal treatments is due in considerable measure to presence of phosphide banding is said to have been confirmed by experiments.

Open-Hearth. Effect of Time at which Silicon is Added on the Physical Properties and Gas Content of Open-Hearth Mild Steel (Der Zeitpunkt der Siliziumzugabe in seiner Wirkung auf die physikalischen Eigenschaften und den Gasgehalt von Martin-Flusseisen), E. Piwowarsky. Stahl u. Eisen, vol. 40, no. 23, June 10, 1920, pp. 773-781, 5 figs. Results of experiments show that high temperature is favorable in the tapping of basic silicated Martin charges to a separation of the silicates present as reduction product; the ferrosilicon addition should be made as late as possible as it reduces considerably the gas content of the finished product in liquid, solid and rolled condition.

Oxidation, Prevention of. Calorizing Process to Prevent Oxidation, G. F. Burger. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 109-110, 2 figs. Calorizing process which consists of applying mixture of alumina and other ingredients at high temperature to metallic surface is said to protect treated parts from high temperature oxidation.

Oxygen Content, Determination of. Equilibrium Conditions in the System Carbon, Iron Oxide, and Hydrogen in Relation to the Ledebur Method for Determining Oxygen in Steel. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 350, Nov. 10, 1919, pp. 353-366, 2 figs. It was found that graphite did not reduce ferrous oxide or water vapor at 900 deg. cent. if hydrogen was passing at rate of two liters or more per hour; also that combined carbon in iron reduced ferrous oxide, with formation of carbon monoxide, under same conditions, to extent varying with proportion of carbide present. It was estimated that Ledebur method under most favorable conditions could not account for more than 75 per cent of oxygen present in steel as ferrous oxide.

Oxygen Content by the Ledebur Method of Acid Bessemer Steels Deoxidized in Various Ways. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 346, Nov. 11, 1919, pp. 259-270, 5 figs. Ledebur method for oxygen did not indicate any deoxidation tests at Watertown Arsenal and at plant of Bethlehem Steel Co. Significant differences in oxygen content in steels with nearly identical chemical composition and heat treatment but having different deoxidation treatment and no difference in nitride nitrogen were shown for such steels.

Phosphorus in. See Sulphur and Phosphorus in.

Physical Properties. Notes as to Rates of Reaction in Certain Steels at 930 deg. cent., E. D. Campbell and B. A. Soule. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 1, 6 pp. It was desired to determine whether when bar of steel 6 mm. square by 15 cm. long was hardened by quickly plunging it into ice water there would be detectable difference in chemical constitution between two ends of bar. It was found that difference in rate of cooling of two ends of bar produces changes in chemical constitution which result in differences in thermo-electromotive potential much in excess of anything attributable to experimental error. Differences in potential at opposite ends indicated difference in chemical constitution.

The Effect of Initial Temperature upon the Physical Properties of Steel, J. H. Andrew, J. E. Rippon and C. P. Miller and A. Wragg. Iron & Steel Inst., advance proof (meeting, May 6 and 7, 1920), 82 pp., 76 figs., 5 on supp. plate. Also in Eng., vol. 109, no. 2838, May 21, 1920, pp. 681-684, 9 figs. Effect of variation in initial temperature upon position of resulting transformation points in certain nickel, chromium and nickel-chromium steels is determined. Volume change at normal transformation points, found to be composed of two changes working in opposition—allotropic change, and change due to carbide; quenching merely stereotypes condition of carbide, which controls allotropic change; nickel-chromium steels behave in much the same way as carbon steel, except that in latter time factor necessary to produce same changes in carbide is of much lower order; in tested carbon steels, quenched at 1000 deg. cent. iron product is in alpha state.

Production During War. The Iron and Steel Trades During the War, M. S. Birkett. Iron & Coal Trades Rev., vol. 100, no. 2716, Mar. 19, 1920, pp. 381-384. Tables showing production and exports of iron and steel of each of chief steel-producing countries for 1913, 1918 and 1919. Paper read before Roy. Statistical Soc.

Production in U. S. Statistics of Rolled Steel Products—Smaller Tonnages in 1919 than in Preceding Year. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 985-987. Statistics compiled by Am. Iron & Steel Inst. showing production of steel ingots and castings and other products.

See also IRON AND STEEL, Production in U. S.

Properties at High Temperatures. Properties of Iron and Steel at High Temperatures, A. E. White. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 521-528, 8 figs. Photomicrographs of steels of different compositions at high temperatures. Graphs of physical characteristics of various steels at high temperatures, constructed from data obtained by various experimenters, notably, H. J. French at United States Bur. of Standards.

Properties Below Critical Range. Physical Changes in Iron and Steel Below the Thermal Critical Range, Zay Jeffries. Min. & Metallurgy, No. 158, Section 20, Feb. 1920, 17 pp. Survey of technical literature and account of experimentation work. Committee report presented to Engineering Division of Nat. Research Council.

Radiographic Examination of. See RADIOMETALLOGRAPHY, Steel, Examination of.

Rifle-Barrel, Flaws in. Location of Flaws in Rifle-

Barrel Steel by Magnetic Analysis, R. L. Sanford and Wm. B. Kouwenhoven. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 343, Oct. 3, 1919, pp. 219-230, 16 figs. Apparatus specially constructed was used to explore a number of bars for magnetic uniformity. Results are said to have demonstrated that magnetic method is amply sensitive to detect and locate flaws.

Semi-Steel. See SEMI-STEEL.

Shearing at High Temperatures. Energy Necessary to Shear Steel at High Temperatures, Guy D. Newton. Univ. of Mo. Bul., vol. 21, no. 4, Feb. 1920, 16 pp., 10 figs. Tests made to determine shearing resistance of steel at working temperature.

Solidification. See METALS, Solidification.

Specifications. Report of Committee A-1 on Steel. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 42 pp. Phosphorus and sulphur requirements in A. S. T. M. steel specifications, and revised standard specifications for welded steel pipe, are included.

Steel Specifications, F. A. Weymouth, N. E. R. R. Club, Jan. 13, 1920, pp. 239-247 and (discussion) pp. 247-253. Suggestions in regard to drawing up list of specifications.

Stainless. Stainless Steel, Leslie Aitchison. Eng. and Indus. Management, vol. 3, no. 4, Jan. 22, 1920, pp. 114-117. Properties and uses.

Storage. See STORING MATERIALS, Steel.

Structural. See STRUCTURAL STEEL.

Sulphur and Phosphorus in. Contemporary Foreign Opinion on Sulphur and Phosphorus in Steels, Henry S. Rawdon. Chem. & Met. Eng., vol. 22, no. 13, Mar. 31, 1920, pp. 609-611. Result of canvassing opinions at English and French metallurgical centers as to how moderate increases in sulphur and phosphorus would influence laboratory tests and service performance of steels.

Metallurgical Theories Conflict. Foundry, vol. 48, no. 12, June 15, 1920, pp. 467-468 and p. 495. Bibliography on effect of phosphorus and sulphur in steel compiled by joint committee of several technical societies.

Sulphur and Phosphorus in Steel, E. E. Thun. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 368-391. Survey of technical literature on effect of sulphur and phosphorus on quality of steel. Outline of tests to be conducted by representative committee appointed upon initiative of Am. Soc. for Testing Materials, U. S. Railroad Administration and Bur. of Standards for investigation of problem.

The Distribution of Phosphorus in Steel Between the Points AC1 and AC3, J. H. Whiteley. Iron & Steel Inst., Paper 9, Annual Meeting, May 6 and 7, 1920, 24 pp., 24 figs. Steels in which phosphorus varied from 0.006 to 0.12 per cent were heated to and maintained at temperatures between critical points Ac1 and Ac3. Part of phosphorus contained in Y-iron diffused into adjacent ferrite. At temperatures below 650 deg. cent. phosphorus diffused extremely slowly in ferrite; above this temperature, velocity gradually increased, and above 800 deg. cent. it was rapid. Velocity of diffusion of phosphorus in Y-iron also increased with temperature.

Sulphur in. See STEEL MANUFACTURE, Open-Hearth Process.

Sulphur Segregation by Aluminum. Aluminum Additions and Sulphur Segregation, Mark C. Smith. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1426-1427, 2 figs. Account of tests made to ascertain proper amount of aluminum requisite to prevent sulphur segregation. Carbon content of steel was 0.15 per cent. Ingot to which 10 oz. of aluminum per ton of steel were added showed best results.

Surface Changes when Heated. Surface Changes of Steels Heated in Vacuo, E. Heaton Hemingway and Geo. R. Ensminger. Min. & Metallurgy, no. 164, Aug. 1920, p. 24. Also in Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 436-441, 8 figs. Three types of markings were observed when samples of steel were held at 1000 deg. cent. in vacuo for a few hours: A deeply marked polyhedral structure, which represented final gamma boundaries; fine clean-cut structure representing alpha boundaries; and indefinite structure corresponding to boundaries of former gamma crystals that have been absorbed by crystalline growth. Paper read before Washington section of Am. Soc. M. E.

Tempering. See Hardening; STEEL, HEAT TREATMENT OF, Tempering.

Testing. Comparative Static and Dynamic Tensile Tests (Vergleichende statische und dynamische Zugversuche), Otto Fuchs. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 12, Mar. 20, 1920, pp. 273-277, 5 figs. Results of comparisons are said to show that capacity for deformation under dynamic stress is greater for soft iron and less for steel than under static stress; the tension-elongation curve increases under dynamic stress less rapidly than under static stress.

Testing Steel, W. G. Lottes. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 537-541, 6 figs. Endurance testing of heat-treated and non-heat-treated, punched and drilled bars. Punched average 131 per cent better than drilled; plain showed gain of 100 per cent over punched; plain heat-treated compared 108 per cent with non-heat-treated; drilled treated 95 per cent over drilled non-treated.

Turbine. Turbine Steels: A Research into Their Mechanical Properties, W. H. Hatfield and H. M. Duncan. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 36, part 6, Apr. 1920, pp. 321-354, 21 figs. Results of investigations are said to generally indicate that commercial forgings are of moderately good quality steel, but that qualities which can be induced in small masses are not obtained nor are they to be expected in large masses. With regard to turbine parts, it is concluded that design may be factor of greater importance than quality of steel. Tensile test is said to give good indication of quality of material, though perhaps not sufficient for absolute reliance.

Uranium. See URANIUM STEEL.

Vanadium. See VANADIUM STEEL.

Welding. See High-Carbon, Welding.

Wire, Tensile-Strength Chart. Charts for Testing Steel and Steel Wire, H. M. Brayton. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 20-22, 4 figs. Tensile strength of steel and reduction in area are shown in relation to breaking down and diameter of wire.

Works. See STEEL WORKS.

Zirconium in, Determination of. The Determination of Zirconium in Steel, G. E. F. Lundell and H. B. Knowles. Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 562-567. Review of published methods for determination of zirconium in steels, and exposition of suggested method for determination of silicon, aluminum, titanium, and zirconium in steels containing other probable or possible alloying elements such as tungsten, chromium, vanadium, phosphorous, molybdenum, copper, nickel, cobalt, uranium, and cerium.

[See also IRON-CARBON ALLOYS.]

STEEL CASTINGS

Annealing. See FURNACES, ANNEALING, Steel Castings.

Design and Treatment. Practical Notes on the Design and Treatment of Steel Castings, George F. Preston. Iron & Steel Inst., Paper 7, Annual Meeting, May 6 and 7, 1920, 12 pp., 9 figs. Also in Foundry Trade Jl., vol. 22, no. 222, June 1920, pp. 433-435, 9 figs. and Eng., vol. 109, no. 2840, June 4, 1920, pp. 768-770, 9 figs. Prevention of piping, drawing and honeycombing.

See also Treatment.

Electric-Furnace. Castings from the Electric Furnace, R. C. Gosrow. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 858-862. Data collected from tensile tests of low-carbon steel made in electric furnace.

Steel Castings by Electric Furnace Process, J. H. Moore. Can. Foundryman, vol. 11, no. 5, May 1920, pp. 124-125, 1 fig. Fundamental principle of electric furnace, and other data are given. Method adopted by one firm in turning out steel castings by electric process is described.

Fatigue Tests. Better Steel Castings Are Required, H. A. Neel. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 824-826, 1 fig. Fatigue bending tests of steel made on Upton-Lewis machine. Paper read before Steel Treating Research Soc.

Heat Treatment of. Heat Treatment of Steel Castings, A. N. Conarroe. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 596-598, 10 figs. Crystalline growth induced by too hot metal-heating molds which hold temperature near solidifying point of steel for a long time. Impurities absorbed from spout and ladle refractories.

The Use of the Microscope in Foundry Problems, G. R. Bolsover. Metal Industry (Lond.), vol. 16, no. 5, Jan. 30, 1920, pp. 85-87, 16 figs. Variations in properties of steel effected by suitable heat treatment are pointed out. Paper read before Instn. British Foundrymen.

Light. Light Steel Castings, R. J. Dunderdale. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 167-168. Causes of failures in light steel castings.

114-Ton Ingot. Casts 114-Ton Ingot Mold. Iron Trade Rev., vol. 66, no. 20, May 13, 1920, pp. 1402-1403, 3 figs. Special reservoir for storing a large portion of the 135 tons of metal required to pour the casting made of brick-lined cast-iron rings.

Open-Hearth vs. Electric-Furnace. Melting Changes Bring Lower Costs. Foundry, vol. 48, no. 7, Apr. 1, 1920, pp. 253-258, 9 figs. Experience of Bayonne Steel Castings Co., Bayonne, N. J. Open-hearth displaced electric furnace in steel foundry when power charges became excessive. It is said that open-hearth furnace produces steel which is satisfactory in quality for all requirements and at less cost than was possible with electric furnace.

Silico-Manganese for. Silico-Manganese for Steel Castings, E. F. Cone. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 855-857. Experience of American foundrymen in use of one alloy instead of two. Summary of advantages and disadvantages from answers received to circular letter sent to representative American foundries.

Sulphur, Effect on. The Effect of Sulphur on Steel Castings, A. E. White. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 586-587. Minute scrutiny of sulphur held to be not as essential in making steel castings as design, composition, molding, steel-making and annealing practice. It is suggested that basis of accepting steel casting should be broader. Paper read before Am. Foundrymen's Assn.

STEEL FOUNDRIES

See FOUNDRIES, Steel.

STEEL, HEAT TREATMENT OF

Alloy Steels. Alloy Steel and Heat Treatment in the Production of Special Forgings. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 106-108, 7 figs. Practice of Am. Forge & Machine Co. in manufacture of high grade chrome-vanadium and steel forgings.

Some Commercial Heat Treatments for Alloy Steels for Structural Purposes, A. H. Miller. Chem. and Metallurgical Eng., vol. 23, no. 3, July 21, 1920, pp. 113-116, 11 figs. General discussion of principles of heat treatment, having special reference to a nickel-chromium steel, the effect of time in complex heat treatments, and the development of simple heat treatments from the complex.

See also ALLOY STEELS, Heat Treatments for.

Annealing. See ANNEALING.

Automobile and Truck Gears. Development of Commercial Heat Treating, W. H. Phillips. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 28-30, 4 figs. Refers particularly to developing of processes for heat-treating automotive gears.

Automobile Drive Shafts. Heat Treating Automobile Drive Shafts. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 636-637, 3 figs. New plant of Timken-Detroit Axle Co. Furnaces have flues in doors. Waste gases used for preheating.

Ball-Bearing Races. Electric Furnace Installation for Heat Treatment of Ball Bearing Races. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 115-117, 7 figs. Treating equipment consists of pusher type furnace, oil quench tank and oil drawing bath arranged in series for continuous flow of material.

Ball Bearings. The Heat Treatment of Ball Bearing Steel, Carl T. Hewitt. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 395-399, 5 figs. Practice at plant of Fafnir Bearing Co.

Brazed Fittings for Aircraft. Heat-Treating of Brazed Fittings for Aircraft, Archibald Black. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1184-1186, 4 figs. Includes typical list of steels used in aircraft work with their approximate properties.

Carbon Steel. Notes on Heat Treatment of Steel, D. T. Lynch. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 12-19 and 35-37, 11 figs. Comparison of physical properties of plain carbon steel with test results in 6-in. shell, presented with view to emphasize fact that problem of heat treating plain carbon steel is verification of old processes rather than any new development.

Carbonizing, Boxes for. Pots and Boxes Used in Carbonizing, H. H. Harris. Iron Age, vol. 105, no. 10, Mar. 4, 1920, pp. 729-731. Comparative value of cast iron, steel and special alloys for pots and boxes used in heat-treating processes. Each material is found to be best suited for certain specific applications, and it is observed that the only true scale of value is that of comparing their life under service conditions with their initial cost and determining how many units of service each renders per dollar investment.

Carburizing. Pre-Heating in Carburizing, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, Mar. 1920, pp. 288-295, 6 figs. Advantages claimed for pre-heating method of carburizing are greater uniformity of results, speed of operation, economy and convenience as well as, in most cases, greater cleanliness and more comfort for operator.

Effect of. Effect of Heat Treating Steel, Albert

Sauveur. Iron Trade Rev., vol. 66, no. 23, June 3, 1920, pp. 1611-1614, 10 figs., and (discussion) vol. 66, no. 25, June 17, 1920, pp. 1758-1761, 13 figs. States that physical properties of steel do not depend entirely upon the relative proportions of microconstituents but also upon the fineness of the structure. Results of heat treating steel. Paper read before Am. Iron and Steel Inst.

The Effects of Heat on Iron, Gerald W. Hinkley. Jl. Am. Welding Soc., vol. 1, no. 1, Oct. 1919, pp. 17-21, 6 figs. Photomicrographs of steel containing various percentages of carbon.

Electric. Electric Heating of Steel, E. F. Collins. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 121-135, 21 figs. Processes for electric heating of steel at temperatures under 1800 deg. fahr., such as cleaning and enameling steel automobile parts, drying steel wire and rods in steel mills, annealing and hardening of tools, etc.

Equipment for. Notes on Heat Treating Equipment, A. A. Blue. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 444-445, 5 figs. Notes on quenching tanks and method of keeping record of heats and testing.

Selection of Heat Treating Equipment, Alvin N. Conarroe. Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 85-89, 6 figs. Photomicrographs are shown of normalized structure of cast steel, and also of undertreated, overtreated and annealed specimens.

Flakes, Cure of. Cure of Flakes by Proper Heat Treatment, C. S. Crouse. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 329-332, 5 figs. Account of heat treatment practice evolved for heavy nickel steel forgings which is said to have reduced flaky test bars to 15 per cent of total, based on idea that most flakes are caused by internal strains in metal.

Forging Temperatures, Effects of. Effects of Forging Temperatures on the Heat Treatment of Steel, Dana R. Cornell. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 529-537, 6 figs. Experiences had to do with chemical and physical requirements for tubes of 1918 model of 155 mm. Howitzer (Schneider), and record of events during forging, annealing, quenching and temper drawing of typical heat selected from several observed. Comparison of tests and of disposition of forging after each series of tests.

Furnaces. Furnaces Used in Heat-Treating Steel, S. P. Rockwell. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 749-753, 6 figs. Comparison of types of furnaces used in carburizing, hardening and tempering.

Gas Heating. Heat Treatment Using High Pressure Gas, A. C. Roessler. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 450-452, 2 figs. "Romec" system of high pressure gas heating.

Gears. See GEARS, Heat Treatment of.

Hardening. Hardening and Tempering of Metallurgical Products (La trempe et le revenu des produits métallurigiques), Léon Guillet. Revue générale des Sciences, vol. 31, nos. 15-16, Aug. 15-30, 1920, pp. 523-547, 45 figs. Effects of rapid cooling on properties and structure. Photomicrographs of alloy steels, aluminum bronzes, etc.

Hardening Steel Without Distortion, Fred H. Colvin. Am. Mach., vol. 52, no. 10, Mar. 4, 1920, pp. 489-493, 7 figs. Electric furnace and equipment designed to take into account discrepancies between true temperature of steel at any instant and indications of thermocouple on record.

Temperature Ranges in Hardening Steel, Carl T. Hewitt. Iron Age, vol. 106, no. 2, July 8, 1920, pp. 67-68, 2 figs. Relation of scleroscopic hardness and hardening temperatures in deg. fahr. are plotted from results obtained in forty tests. It is concluded that it is safe to harden tools of not less than 5-16-in. cross-section at temperatures as high as 100 deg. fahr. above Ac point without weakening steel.

The Hardening of Steel, H. C. H. Carpenter. Chem. News, vol. 119, nos. 3110, 3111 and 3112, Nov. 21 and 28, and Dec. 5, 1919, pp. 235-238, 248-251, and 261-264, 4 figs. Nov. 21: Survey of scientific investigations conducted in search of explanation of phenomenon of hardening, and exposition of theories which have been developed to explain it. Nov. 28: Structures of pure γ iron, γ iron containing dissolved carbon, pure β iron and pure α iron. Dec. 5: Theories of hardening.

High-Chromium Steel. The Heat-Treatment of a High-Chromium Steel, H. J. French. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 103-109, 10 figs. Experimental determination of effect of various heat-treatments on tensile properties of steel containing about 11 to 15 per cent of chromium and from 0.20 to 0.40 per cent of carbon (stainless steel). With increasing quenching temperature hardness as measured by Brinell and Shore instruments increased until temperature of about 1950 deg. fahr. was reached. Quenching from about 1750 deg. fahr. developed best combination of strength and ductility, which was not coincident with range of maximum hardness. Ductility as measured by elongation and reduction in area was very low in samples quenched from 1850 deg. fahr. or above.

High Strength from. The Elastic Development of Steel, Sidney Cornell. Chem. & Metallurgical Eng., vol. 22, no. 15, Apr. 14, 1920, pp. 677-680, 9 figs. Account of research undertaken by Remington Arms Union Metallic Cartridge Co. to salvage about one million bayonets rejected by inspectors of English Government. Research consisted principally of testing steel heat-treated at various temperatures. It was brought out that unusually high strengths could be produced in medium- and high-carbon steels by high drawings after quenching.

Hump Method. Heat Treating Steel by New Method Claims Valuable Results. Automotive Industries, vol. 42, no. 14, April 1, 1920, pp. 812-815, 6 figs. Hump method. Material is quenched at definite point in heating when temperature rise shows marked decrease and change from previous uniform rate. Advantages claimed are that it results in higher grade and more uniform output and simplifies handling and cleaning.

The Hump Method for Heat Treating Steel. Metal Trades, vol. 11, no. 6, June 1920, pp. 257-261, 8 figs. Also in Blast Furnace & Steel Plant, vol. 8, no. 3, Mar. 1920, pp. 181-185, 6 figs., and Am. Drop Forger, vol. 6, no. 3, Mar. 1920, pp. 129-133, 6 figs. Temperature of furnace is raised on uniform rate until transformation point of steel is reached, at which time consequent change in rate of temperature rise is made visible to operator by autographic recorder connected to thermocouple placed close to or in contact with work.

See also GEARS, Heat Treatment of.

Locomotive Forgings. Notes on the Heat Treatment of Locomotive Forgings and Similar Parts, Lawford H. Fry. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 435-441, 1 fig. Tables of quenching speeds and resulting physical properties.

Low-Carbon Steel. The Effect of Heat Treatment and Mechanical Work on the Physical Properties of Mild Steel, Wilfred Hanby. Jl. Am. Steel Treaters Soc., vol. 2, no. 5, Feb. 1920,

pp. 226-234, 16 figs. Gives results of tests made on steel containing 0.24 per cent carbon, which are said to show that "information obtained from tensile tests alone is by no means sufficient criterion as to true value of material for all purposes of construction."

Microscopic Study. The Microscope and the Heat Treatment of Steel, Albert Sauveur. Iron Age, vol. 105, nos. 23 and 25 (discussion), June 3 and 17, 1920, pp. 1586-1589, 10 figs., and 1717-1720, 8 figs. Photomicrographs illustrating various transformations in structure and properties under thermal conditions. Paper read before Am. Iron and Steel Inst.

Nickel Steel. See NICKEL STEEL, Thermal Treatment.

Partial Cementation. Partial Cementation of Steel by Means of Solid Cements, Gordon A. Webb. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 442-450. Properties acquired by steels of different composition by carburization.

Plant. Heat Treatment for Continuous Operation, L. W. Heiser and J. L. M'Cloud. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 272-274, 2 figs. Proposed heat-treating plant, designed to treat 100,000 lb. of work, in which the operation is continuous.

Punches and Dies. See PUNCHES, Heat Treatment.

Pyrometers for. See PYROMETERS.

Quenching. Efficiency and Application of Quenching Mediums, Victor E. Hillman. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, p. 422. Result of investigation of animal, vegetable, mineral and compound oils for quenching and results of experiments using molten salts for quenching high speed steel. Paper read before Am. Soc. for Steel Treating.

Fuels, Burners and Quenching Mediums for Heat-Treatment, S. P. Rockwell. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 837-840, 5 figs. Points out advantages and disadvantages of different kinds of fuel and types of burners, and gives description of results obtained by various quenching baths.

On the Nature of the A_1 Transformation and a Theory of Quenching, Kôtarô Honda. Sci. Reports Tôhoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 181-205, 23 figs. partly on two supp. plates. Experiments on heat transformations from austenite to martensite and from martensite to pearlite. It is held that martensite is solid solution differing in phase from austenite and that quenching consists in retarding change from austenite to martensite to vicinity of room temperature in order to arrest further changes from martensite to troostite and consequently to sarbite and pearlite.

Rifle and Machine-Gun Barrels. Heat Treatment of Rifle and Machine Gun Barrels, Arthur W. Green. Proc. Steel Treating Research Soc. and Jl. Am. Steel Treaters Soc., vol. 2, no. 12, 1920, pp. 25-30, 9 figs. Also in Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 36-40, 8 figs. Photomicrographs showing grain growth at a high temperature and sorbitic structure throughout piece of steel. Experience of plant is discussed where it is said that production of heat-treated rifle and machine-gun barrels is accomplished practically without rejection.

Screw-Machine Stock, Water-Quenching. Results of a Series of Tests of Water-Quenched Free-Cutting Steel, C. P. Miller. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 87-88, 3 figs. It is concluded from tests that water quenching raises tensile strength of 1 in. screw-machine steel 27 per cent, yield point 28 per cent, reduction of area 8 per cent, while elongation is decreased 22 per cent.

Sorbitic Treatment. The Sorbitic Treatment of Steel. Iron & Coal Trades Rev., vol. 100, no. 2172, Feb. 20, p. 257, 5 figs. Three methods are given for obtaining sorbite, namely, (1) by heating steel above upper critical point, quenching it, and then by careful reheating to about 600 deg. cent.; (2) by rapidly cooling steel in oil or water for short time and then withdrawing and allowing it to temper itself back to desired condition; and (3) by cooling down steel from temperature above upper critical point at rate sufficiently slow to prevent retaining of martensite, yet sufficiently rapid to prevent pearlitic state from being reached.

Spring Steel. Selective Heat Treatment of Spring Steel, E. P. Stenger. Iron Age, vol. 106, no. 1, July 1, pp. 1-3, 2 figs. Experience of company during war. Spring steel with carbon content ranging from 0.90 to 1.05 per cent was needed and only materials obtainable were limited quantities of steel having 0.80 to 0.90 per cent carbon and 1.05 to 1.15 per cent carbon. System of selective heat treatment installed to meet variations in composition is explained.

Steel Castings. See STEEL CASTINGS, Heat Treatment.

Temperatures for. Temperatures for Heat Treating Carbon Steels, F. L. Moister. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 542-544. Following rule is formulated from results obtained from experience. Heat slowly to 1450 deg. fahr., hold at that point until thoroughly heated and quench in freely circulating water; draw 950 deg. to 1000 deg. fahr. if elastic limit of 55,000 lb. is required, and 1000 to 1050 deg. fahr. if elastic limit of 50,000 lb. per sq. in. is required.

Tempering. Influence of Cooling Speed on the Temper of Carbon Steels (Influence de la rapidité du refroidissement sur la trempe des aciers au carbone), A. M. Portevin and M. Garvin. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 132, no. 3, May-June 1920, pp. 297-346, 25 figs. Experimental. It was found in part that when temperature decreases uniformly, formation of troostite takes place at about 650 deg. cent. and martensite is formed slowly at about 300 deg. cent. Increasing speed of cooling lowers point of transformation, but not regularly. Conclusions are formulated in regard to significance of critical tempering speed.

Tool Hardening. Some General Principles of Tool Hardening, A. E. Bellis. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 364-367. Emphasizes that practical means of controlling results from foundry, through rolling, annealing, forging, and hardening, is to maintain uniformity of composition and uniformity of heat treatment.

Treating Uniformly. Heat Treating Steel Uniformly, C. D. Barnhart. Iron Trade Rev., vol. 66, no. 22, May 27, 1920, pp. 1539-1541. Qualities of finished product frequently vary in spite of uniform furnace temperature. Time for saturation, area of surface exposed and mass of the piece are important considerations.

[See also HEAT TREATING, Electric Furnace in.]

STEEL, HIGH-SPEED

Comparison of Classes. A Comparative Test of High-Speed Steels, A. J. Langhammer. Am. Mach., vol. 52, no. 25, June 17, 1920, pp. 1292-1297, 22 figs. Gives chemical composition, microstructure and manufacturing methods, which distinguish really superior brands, with which data, it is claimed, it is perfectly feasible for metallurgist in smaller shops to determine steel best suited to his requirements.

Electric-Furnace Manufacture. The Manufacture of High Speed Steel in the Electric Furnace, Roy C. McKenna. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 31, pp. 417-423. Advantages of electric furnace process over any other way of making high-speed tool steel are pointed out and details of charging, melting, slagging, teeming, forging, heat treatment, etc., are discussed.

Hardening. Metallurgy in the Manufacture of High Speed Steel, Roy C. McKenna. Jl. Am. Steel Treaters Soc., vol. 2, no. 2, Nov. 1919, pp. 88-96 and (discussion) pp. 96-98. Trend of American practice for hardening high-speed steel.

The Hardening of High-Speed Steel, A. H. d'Arcambal. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 498-520, 22 figs. Experiments conducted to determine effects of various hardening methods on hardness, microstructure and cutting efficiency of high-speed steel.

Molybdenum-Alloy. The New High Speed Steel, Leslie Aitchison. Autocar, vol. 44, no. 1264, Jan. 10, 1920, pp. 56-57. Examination of formulæ of cutting steels with special reference to patent by Professor Arnold of Sheffield University. Arnold's discovery consists of substituting in high-speed steel about 6 per cent of molybdenum for 18 per cent tungsten which it normally contains.

Testing. A Comparative Test Upon High-Speed Steels, A. J. Langhammer. Chem. & Metallurgical Eng., vol. 22, nos. 18, 19, 20 and 21, May 5, 12, 19 and 26, 1920 pp. 829-833, 889-892, 939-942 and 969-975, 20 figs. Competition of modern high-speed steels conducted for automotive manufacturer. Conditions entering into testing of tool for cutting, listed by Taylor, are discussed. Detailed information as to method of eliminating most variables from comparative test for efficiency of several brands of commercial tool steel together with data as to performance of each individual tool, its chemical composition, heat treatment, and hardness. To obtain most efficient results from high-speed steel tools they should be operated under heavy duty.

[See also ALLOY STEELS.]

STEEL INDUSTRY

Electric Drive. Electricity in Steel Industry, 1919, G. E. Stoltz. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 4-7, 6 figs. Outlines usual methods of operating electric drive and presents charts showing costs and other data.

Electric Steel. The Electric Furnace and Electric Steel. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 135-137, 2 figs. Data collected by Electric Furnace Assn. relative to quality of electric furnace products. Statistics on electric steel production.

Germany. German Steel and Iron in 1920, H. Cole Estep. Iron Trade Rev., vol. 66, nos. 15, 16, 17, 18, April 8, 15, 22, 29, 1920, pp. 1059-1063, 2 figs., pp. 1131-1139, 6 figs., pp 1189-1193, 4 figs., pp. 1263-1267, 7 figs. Based on writer's personal investigations. Iron and steel industry, it is said, is displaying a certain amount of spirit, energy and valor in its present struggle, but it will be long, if at all, before it can recuperate its former position. Official statistics are quoted which show production has reduced two-thirds since 1913. Labor conditions as affected by food situation. With steel production at low ebb Germany is said to have excess of shop capacity and her shipyards to be nearly idle.

Great Britain, 1919. British Iron and Steel in 1919. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 63-65. Decreasing production, unsatisfied demand, record profit and still advancing prices are recorded.

Metallurgical Progress, 1919. Metallurgical Progress in Steel Industry. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 64-66. Also in Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 56-58. Year of 1919 was notable, it is said, not so much for any radical departures in metallurgical processes or development of new alloys as for broader and more intelligent application of those already known.

Welfare Work. See WELFARE WORK, Steel Industry.

[See also IRON INDUSTRY.]

STEEL MANUFACTURE

Acid Bessemer Process. The Acid Bessemer Process, Richard S. McCaffery. Min. & Metallurgy. no. 163, July 1920, p. 36. Consideration of certain aspects of acid Bessemer process, particularly in its relations to the duplex process.

Acid Open-Hearth. Notes on the Acid Open Hearth Process, B. De Mare. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 318-324 and p. 385, 3 figs. Discussion of practice as carried out in open hearth department of Nicetown plant of Midvale Steel & Ordnance Co.

Sulphur in the Acid Open-Hearth Process, F. A. Matthewman. Jl. West of Scotland Iron & Steel Inst., vol. 27, nos. 2 and 3, Nov.-Dec. 1919, pp. 34-37 and (discussion) pp. 37-41, 1 fig. Also in Iron & Coal Trades Rev., vol. 100, no. 2172, Feb. 20, 1920, pp. 243-244. Cases are quoted where in making steel for angles, etc., for ship construction, it happened that charges arranged to contain about 0.04 or 0.05 per cent sulphur yielded product which showed on analysis 0.08 per cent or even higher. Clay wash or silica paint applied to scrap is suggested as remedy.

The Reduction of Silicon from the Slag in the Acid Open-Hearth Process, B. Yaneske and G. A. Wood. Iron & Steel Inst., Paper 12, Annual Meeting, May 6 & 7, 1920, 20 pp., 2 figs. Also in Eng., vol. 109, no. 2837, May 14, 1920, pp. 666-668, 2 figs. Examples of finished steels containing much higher percentage of silicon than expected from finishing additions.

Basic Open-Hearth. Making Basic Open-Hearth Steel, C. W. Veach. Iron Trade Rev., vol. 67, no. 3, July 15, 1920, pp. 178-179. Overcoming slag inclusions. Results of slag tests on basic steel.

Notes on Slag Conditions in Open-Hearth Basic Steel-Making Practice, Jno. F. Wilson. Iron & Steel Inst., Paper 10, Annual Meeting, May 6 & 7, 1920, 22 pp., 3 figs. Opinion is expressed that in fluid state, slags cannot contain any "free acids" or "free bases," and can be viewed as solution of different chemical compounds in one another. "Free acids" or "free bases," by themselves, it is said, demand higher temperatures to bring them to a molten condition than is usually attained by steel furnace slag.

Bessemer Process. Metallurgical Procedures for Acid and Basic Bessemer Processes Based on Spectrum-Analysis Observations. (Die metallurgischen Vorgänge beim sauren und basischen Windfrischverfahren auf Grund spektralanalytischer Beobachtungen), L. C. Glaser. Stahl u. Eisen, vol. 40, no. 6, Feb. 5, 1920, pp. 188-193, 11 figs. It is claimed that by application with spectrum-analysis observations in connection with customary tests, it is possible to control Bessemer process and also to determine the melting action and, accordingly, to measure and regulate the addition of alloy. Bibliography containing 72 references is included.

See also Acid Bessemer Process.

Casting and Molding Ingots. Casting and Molding Steel Ingots, Emil Gathmann. Min. & Metallurgy, no. 164, Aug. 1920, pp. 29-31. Best results as to freedom from surface blowholes, snakes, etc., in evolution steels are said to be obtained when ingots are bottom cast. Method by which similar results were obtained with other steels is described which consisted of employing special teeming or pouring nozzle whereby pressure and velocity of liquid steel as it entered mold was greatly reduced, without, however, reducing quantity or volume per minute of steel teemed. (Abstract.)

Costs. Comparing Costs of Steel Making, E. H. Ballard. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 697-698. Statement of cost covering operation during four months of 20-ton acid open-hearth furnace and 6-ton basic electric furnace are compared and discussed. Paper read before Am. Foundrymen's Assn.

Duplex Process. Develops New Duplexing Process, H. E. Diller. Iron Trade Rev., vol. 66, no. 19, May 6, 1920, pp. 1324-1327, 9 figs. High-carbon steel is melted in electric furnace and transferred to converter to be finished. It is said that good grade metal is thus obtained at low cost.

Electric-Furnace. Manufacture of Steel in the Electric Furnace (Le four à arc pour la fabrication de l'acier), H. Verdinne. Revue universelle des Mines, vol. 5, no. 1, Apr. 1, 1920, pp. 5-52, 26 figs. Classification and description of principal types of electric furnaces used in steel manufacture.

The Electric Furnace and the Central Station, H. L. Hess. General Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper 14, pp. 207-220. Economic aspect of securing power from central station for manufacturing electric steel is discussed. World's production in 1918 amounted to 1,155,273 tons, the United States leading with 511,364 tons.

See also ELECTRIC FURNACES, Steel.

Electric Furnaces for. Iron and Steel Electric Furnaces, James Bibby. Jl. West of Scotland Iron & Steel Inst., vol. 27, nos. 2 and 3, Nov.-Dec. 1919, pp. 21-26 and (discussion) pp. 26-29. Recommendations in regard to construction of electric furnaces for manufacture of molten iron and steel.

Electric Heating in. Electric Heating in Steel Wire Manufacture. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 291-293, 2 figs. Comparative cost statistics taken at plant of Halcomb Steel Co., Syracuse, N. Y., on drying ovens heated electrically and similar ovens using coke and steam. Coke ovens cost $22.289 per net ton, against $12.2926 per net ton for electric.

Fuel Economy. Fuel Economy and Consumption in the Manufacture of Iron and Steel, W. A. Bone, R. Hadfield and A. Hutchinson. Engineer, vol. 128, nos. 3326 and 3327, Sept. 26, and Oct. 3, 1919, pp. 316-317 and 341-343, 1 fig. Abstract of report presented to Iron and Steel Institute Autumn Meeting, on behalf of British Assn. Fuel Economy Committee.

Fuel Economy in the Iron and Steel Manufacture. Engineering, vol. 108, no. 2803 and 2804, Sept. 19 and 26, 1919, pp. 392-396, 423-425, 1 fig. Object of investigation was to obtain data as to present state of fuel consumption and economy in regard to blast furnace practice, steel works and rolling mills producing ordinary steel sections. Committee report presented at meeting of Iron & Steel Inst.

Hot Flow During. Hot Flow of Steel During Ordinary Processes of Manufacture, J. Neill Greenwood. Iron & Coal Trades Rev., vol. 100, no. 2717, Mar. 26, 1920. Writer concludes that metallurgists should give most careful consideration to mechanical treatment which steel receives in manufacture of any particular object; when mechanical processes are studied and detailed flow caused is mapped out by methods here indicated, many inherent defects and possibilities of trouble will be found. Abstract of paper before Staffordshire Iron & Steel Inst.

Ladle Hangers. The Breaking of Ladle Hangers (Ueber den Bruch von Giesspfannengehängen). Stahl u. Eisen, vol. 39, no. 44, Oct. 30, 1919, pp. 1309-1315 and (discussion) pp. 1315-1318, 8 figs. Discussion of causes and suggested remedies. Writer attributes breaking to variation in temperature and lack of elasticity in hanger material.

Open-Hearth. See Acid Open-Hearth; Basic Open-Hearth.

Pyrometers, Use of. See PYROMETERS, Steel Manufacture.

Rolling Mills. See ROLLING MILLS.

Spiegeleisen, Use in. Use of Spiegeleisen in Steel Manufacture, Henry D. Hibbard. Dept. Interior, Bur. Mines, Monthly Reports of Investigations, Nov. 1919, 8 pp. Also in Iron Trade Rev., vol. 66, no. 3, Jan. 15, 1920, p. 220, and Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 209-210. Possibilities of utilizing greater quantity of spiegel and intermediate grades of ferromanganese.

[See also ELECTRIC FURNACES, Induction; Metallurgical Uses; RAILS, Pipeless; OPEN-HEARTH FURNACES, Gas-Fired.]

STEEL MILLS

See STEEL WORKS.

STEEL PLANTS

California. Builds Modern Steel Plant in California. Iron Trade Rev., vol. 67, no. 1, July 1, 1920, pp. 29-32, 7 figs. Features of new steel plant built by Columbia Steel Co. Plant consists of three mills, buildings and mill equipment arranged so that steel travels in practically straight line from the time the ingots are broken down until the finished bars reach the warehouse.

Electricity in. Electrical Features of a Modern Steel Plant, R. B. Gerhardt. Jl. Engrs. Club of Philadelphia, vol. 37, no. 185, April 1920, pp. 145-156, 19 figs. Description of Maryland plant of Bethlehem Steel Corporation, which is now nearing completion after undergoing extensive construction program during past four years, involving expenditure of $50,000,000.

Fire Prevention. Preventing Fire at Steel Plants, Walter F. Mulhall. Iron Trade Rev., vol. 67, no. 10, Sept. 2, 1920, pp. 655-657, 8 figs. It is urged that various departments be equipped with safety waste cans in which all refuse should be deposited. Importance of daily inter-mill inspection is pointed out and care and operation of hand extinguishers discussed.

[See also STEEL WORKS.]

STEEL STRUCTURES

Erection. Safety in Steel Erection, E. A. Gibbs. Safety Eng., vol. 38, no. 5, Nov. 1919, pp. 275-277. Principles of a Pittsburgh company regarding equipment. From Proc. of Eighth Annual Safety Congress.

[See also FRAMING, Vertical-Load Moments.]

STEEL WORKS

Bessemer Plant, Indiana. New Bessemer Plant in Indiana. Iron Age, vol. 105, no. 10, Mar. 4, 1920, pp. 741-742, 2 figs. Attention is called to arrangements for delivery of scrap, scale

and molten iron to converters, and pouring facilities. A 15-ton casting crane operating with 22-ft. radius serves converters which are arranged to blow in opposite directions.

Blowers. The Motive Power of Steel Works Blowers (Der Antrieb von Stahlwerkgebläsen), Hubert Hermanns. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 4, Jan. 24, 1920, pp. 84-87, 8 figs. Descriptive article concluding with statement that present conditions make preferable the selection of a gas-engine driven piston blower or a motor-driven turboblower using current from a generator driven by gas engine, the latter being preferable.

Braeburn Steel Co. Braeburn Steel Co. Increases Capacity for Making and Rolling High Grade Steels, Alfred M. Staehle. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 38-45, 14 figs. New additions include six-ton Heroult electric furnace, Baily electric annealing furnace, wire mill and machine shop and modern sub-station. Data on steel processes and furnace power charts.

Cranes. See CRANES, Ladles.

Ebbw Vale. The Electrification of the Works and Collieries of the Ebbw Vale Steel, Iron and Coal Company, Limited, Walter Dixon. Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 419-421, 5 figs. Also Engr., vol. 130, no. 3378, Sept. 24, 1920, pp. 299-300, 5 figs. Works are expected to provide after completion of improvements, annual output of 5,500,000 tons of coal, 575,000 tons of coke, and 450,000 tons pig iron. Allied industries embrace manufacture of steel rails and sleepers, galvanized steel sheets, weldless steel tubes and couplings, coke-oven and blast-furnace by-products, iron and steel castings and engineering work. Paper read before Iron & Steel Inst.

Economizers in. See ECONOMIZERS, Steel Works, Value in.

Electric Drive. See ELECTRIC DRIVE, Steel Mills; ELECTRIC MOTORS, Steel Mills.

Electric Welding in. See ELECTRIC WELDING, ARC, Steel Mills.

Electrically Driven. Application of Power in Steel Mills. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 673-676, 4 figs. Comparative data on operation of electric drive and steam drive from tonnage standpoint. Factors which enter into choice between overhead and underground transmission systems. From papers read before Assn. of Iron and Steel Elec. Engrs.

Direct Current Compared with Three-Phase Current for Driving Steelworks Plant, C. A. Ablett. Iron & Steel Inst., Paper Annual Meeting, May 6 & 7, 1920, 17 pp., 2 figs. Direct-current motors are preferred because they are capable of speed variation over wide range without loss of power, while three-phase motors are not capable of such variation without considerable loss of power unless they are of complicated and costly type, "and therefore not well suited to many steel works purposes."

Electrically Driven Steel Reversing Mills, Fraser Jeffrey. Power, vol. 51, no. 26, June 29, 1920, pp. 1030-1033, 5 figs. Tonnage output per cost of operation and maintenance rather than first cost, it is said, is basis on which electricity is efficiently replacing steam as a mill drive. An installation is described in which a reversing motor and its necessary complements replaced an engine unit.

Electricity in. Electricity in a Large Modern Steel Plant, R. B. Gerhardt. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 295-298. Details of electrical apparatus at Maryland plant of Bethlehem Steel Co. Paper read before Philadelphia Section of Assn. of Iron & Steel Elec. Engrs.

Gary, Ind. Gary Works Expanded Fifty Per Cent During War, Gilbert L. Lacher. Iron Age, vol. 106, no. 12, Sept. 16, 1920, pp. 699-710, 13 figs. Additions consist of two coke-oven batteries, four blast furnaces, duplex plant, wheel works, and blooming, sheet and merchant mills.

Laboratory. New Laboratory at Union Drawn Steel Co. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 60-61, 1 fig. Description of building arrangement, instruments and other equipment for methodical testing of product and for research.

Lorraine, France. Lorraine Steel Works in French Hands. Machy. (London), vol. 105, no. 15, April 8, 1920, pp. 1023-1024 and 1039. Abstract of report of trade commissioner J. F. Butler sent from Paris to Bureau of Foreign & Domestic Commerce at Washington, giving account of extent of industry in annexed territory, difficulties with labor under new ownership, etc. Output is said to be only one-third of normal.

Machinery, French Works. Machinery at the Steel Works of the Société Normande de Métallurgie, Caen, France. Eng., vol. 109, no. 2826, Feb. 27, 1920, pp. 284 and 293-294, 24 figs. partly on 4 supp. plates. Metal mixer, ladle cranes, soaking pits, and billet-handling cranes.

Margam. The New Margam Works of Baldwins, Ltd. Iron & Coal Trades Rev., vol. 101, no. 2742, Sept. 17, 1920, pp. 353-359, 40 figs. partly on 6 supp. plates. Self-contained unit, with coal washery, coke ovens, by-product plant, blast furnaces, steel-smelting plant and rolling mills.

Port Talbot. The Port Talbot Steel Works. Iron & Coal Trades Rev., vol. 101, no. 2742, Sept. 17, 1920, pp. 362-364, 5 figs. Melting plant has capacity of 7000 tons of ingots per week. Sections, rounds, squares, flats and light rails are largely manufactured in mills.

Power Plants. Current Limiting Reactance, R. H. Kiel. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 554-556. Disadvantages of centralizing generating equipment. Means for aiding power house in maintaining a continuous supply of electric power on its lines. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

Some Economic Considerations in Design of Power Plants for Steel Mills, T. E. Keating. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 570-574. Deals with economic centralization of power generation for various units of steel industry. How to design power plants for greatest economy. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

Protection. See INDUSTRIAL PLANTS, Protection.

Pulverized Coal for. See PULVERIZED COAL, Steel Plants.

Safety Movement in. Safety Movement in Steel Mills, C. M. Brading and F. A. Wiley. Assn. Iron & Steel Elec. Engrs., Oct. 1919, pp. 3-17. Planning, direction and supervision of safeguarding and education as elements in safety movement.

Signaling in. See SIGNALING, Acoustic.

Waste-Heat Operated. Steel Plant Operated with Waste Heat. Iron Age, vol. 106, no. 13, Sept. 23, 1920, pp. 765-769, 7 figs. New Works of Electric Steel & Forge Co., Cleveland, for manufacture of alloy steels. Ingots broken down under hammer.

[See also BLAST FURNACES; COKE PLANTS, By-Products; EXPLOSIONS, Coal-Dust; OPEN-HEARTH FURNACES; ROLLING MILLS; STEEL PLANTS.]

STELLITE

Manufacture and Uses. Stellite, Elwood Haynes. Gen. Meeting Electrochemical Soc., Apr. 8-10, 1920, no. 26, pp. 377-381. Account of invention of stellite and its varieties; its manufacture by melting together constituent metals, or by simultaneous reduction of mixture of oxides of these metals by carbon or aluminum, in crucibles or in electric furnace. Account is also given of properties and performances of alloy.

Reflectivity of. See REFLECTIVITY.

[See also CUTTING METALS, Stellite Tools for, CUTTING TOOLS, Stellite.]

STEREOSCOPY

Apparatus. Apparatus for the Simultaneous Examination of the Same Stereoscopic Plate by Two Persons (Appareil pour l'examen simultané d'un même cliché stéréoscopique par deux personnes), André Chéron. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 20, Nov. 17, 1919, pp. 912-914, 1 fig. Oculars are placed on either side of plate and between this and each side of ocular is placed glass at 45 deg. which reflects light from source alongside of plate on both sides of latter.

STILL ENGINE

See MARINE ENGINES, Still vs. Sulzer.

STILLS

See HEAT PUMPS.

STOKERS

Chain-Grate. A New Overfeed Automatic Stoker. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, p. 1088, 2 figs. Machine is of incline moving grate overfeed type. It is claimed that use of overfeed principle results in ash being kept in zone of low temperature.

Developing the Chain-Grate Stoker, H. F. Gauss. Power, vol. 51, no. 4, Jan. 27, 1920, pp. 144-146, 2 figs. Application of forced draft, it is said, has resulted in much higher rates of combustion, reduction of ignition troubles, better air control to various sections of grate and less leakage of air into furnace.

Conveyor-Feed Type. A Stoker for Burning Eastern Coals, L. R. Stowe. Mech. Eng., vol. 42, no. 5, May 1920, pp. 279-282, 4 figs. Stoker developed by Laclede-Christy Clay Products Co. It is of conveyor-feed type and operates with mechanical draft. Caking is said to be prevented by high ignition temperatures employed, graduation of supply from feeding and to discharge end, and thickening of fire at point of ash discharge.

Fuel-Blending. Nicol-Schofield Stoker for Blended Fuels (Appareils de chauffe mécanique à plusieurs combustibles, système Nicol et Schofield). Génie Civil, vol. 76, no. 18, May 1, 1920, pp. 411-413, 4 figs. Two layers of coke and coal are fed simultaneously into furnace. Coal layer is on top. Each fuel is kept in separate pit.

Low-Grade Fuel-Burning. The Development of the Pluto Stoker for Utilization of Low-Grade Fuels (Die Entwicklung des Pluto Stokers für Verwertung minderwertiger Brennstoffe), Otto Nerger. Stahl u. Eisen, vol. 40, no. 29, July 22, 1920, pp. 969-975, 8 figs. Describes improvements of Pluto stoker, including hollow grate bar with removable sectional tops, spring-tightened side walls, adjustable suspension grate, and operation by "water column" motor. Results of experiments are given.

Marine-Boiler. Mechanical Stokers Aboard Ships, Charles H. Bromley. Power, vol. 51, no. 3, Jan. 20, 1920, pp. 86-89, 8 figs. Illustrates various types which are being installed aboard ships in England and United States.

Reagan Automatic. Reagan Automatic Stoker. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 759-760, 5 figs. It has adjustable feed of from 0 to 60 lb. of fuel per sq. ft. of stoker surface per hr. and is equipped with mechanical ash unloader, water-cooled water beam under rest grate and water-cooled bridge-wall and ash-pusher.

Saving Effected by. Where Four Boilers Do the Work of Six, T. A. Marsh. Factory, vol. 25, no. 3, Aug. 1, 1920, pp. 366-368, 4 figs. By installing different style of stoker and making few simple changes in furnace setting, plant of Green Engineering Co. was able to develop as much power as before with fewer boilers and cheaper grade of fuel.

Tests. Mechanical Stoker Tests. Jl. Instn. Mech. Engrs., no. 4, May 1920, pp. 281-313 and (discussion) pp. 314-428. Details of performance of 80 typical mechanically fired "Lancashire" steam boiler plants in Great Britain.

Underfeed. New Heavy Duty Underfeed Stoker. Can. Manufacturer, vol. 40, no. 9, Sept. 1920, pp. 50-52. Jones automatic-cleaning underfeed stoker manufactured in Canada by Underfeed Stoker Co. of Canada, Toronto. Manufacturers claim that it will effect guaranteed fuel saving of at least 10 per cent.

[See also FURNACES, BOILER, Air Cooled Scraper Grate.]

STONE

Artificial. The Grinding and Polishing of Artificial Stone and Marble Slabs (Schleifen und Polieren von Kunststein und Kunstmarmorplatten). Tonindustrie-Zeitung, vol. 44, no. 11, Jan. 24, 1920, pp. 94-95, 1 fig. Details of construction and manipulation of a wall-arm grinding and polishing machine designed by the Dr. Caspary & Co. Machine Works.

Preservation. Stone Preservation Tests. (Ueber Versuche mit Steiner haltungsmittein), U. Rathgen. Zeitschrift für Bauwesen. vol 69. nos. 7-9, 1919, pp. 443-459, 6 figs. Marble, limestone and sandstone were tested. Details of solutions with which they were saturated.

STONE, CRUSHED

Standard Sizes. Standard Sizes of Crushed Stone, Frank H. Jackson, Jr. Rock Products, vol. 23, no. 4, Feb. 14, 1920, pp. 32-33. Efforts being made by American Society for Testing Materials and U. S. Bureau of Public Roads in coöperation with manufacturers of crushed stone.

[See also SAND, Plants.]

STONEWARE

Chemical. Erection and Use of Chemical Stoneware Apparatus. Chem. Age, vol. 28, no. 5, May 1920, pp. 171-174, 9 figs. It is pointed out that in use of chemical stoneware it is necessary to remember always following facts: Stoneware is a fragile material whose resistance to tension and flexure is limited, while its resistance to compression is considerable; it withstands sudden changes in temperature very poorly; this ability to undergo temperature changes improves with diminution in thickness of apparatus and with regularity of heating. Various practical applications of above principles are discussed. Abstracted from Chemie et Industrie (vol. 2, 899-913).

STORAGE

Piling. See MATERIALS, Storing.

STORAGE BATTERIES

Chemical Reactions in. The Reactions of the Lead Accumulator, D. A. MacInnes, L. Adler and D. B. Joubert. Gen. Meeting Electrochem-

ical Soc., Apr. 8-10, 1920, no. 27, pp. 383-390, 1 fig. Experimental study of amount of sulphuric acid consumed during discharge of lead accumulator in order to decide between Gladstone and Tribe's formula for chemical reaction and that advanced by Fèry. Results obtained were not definite for either, and it is suggested tentatively that intermediate oxides of basic compounds may be formed during discharge.

Improvements in. Progress in Accumulator and Element Technique (Neuerungen auf dem Gebiete der Akkumulatoren- and Elementetechnik), A. Blaschke. Elektrochemische Zeitschrift, vol. 26, no. 8-9, Nov.-Dec. 1919, pp. 87-91. Improvements of accumulator paste by rendering it more porous by chemical or mechanical means or by both combined are noted and various patents for manufacture of accumulators, electrodes and accumulator plates are described.

Non-Liquid. New Non-Liquid Storage Battery of Durable Construction. Automotive Industries, vol. 42, no. 4, July 22, 1920, p. 157. Storage battery without a liquid electrolyte and with many of the features of a primary cell.

STORING MATERIALS

Steel. The Organization of a Steel Stores, E. A. Allcut. Eng. & Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 707-708, 2 figs. Classification and discussion of systems of steel storage.

Tools. A Group Tool Storage System, Peter F. O'Shea. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 893-895. Acts enacted in various States.

STORM DETECTOR

New York Edison Co. A Wireless Storm Detector for the Central Station, Herbert T. Wade. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 18-21, 6 figs. Installation at Waterside Station of New York Edison Co.

STORM WATER

Run-Off. Storm Water Run-Off Diagram for Rational Method, George C. D. Lenth. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 151-152, 1 fig. Diagram made to give run-off on given area in second-feet, when time of concentration, area, and ratio of run-off to rainfall has been determined.

STOVES

Electric. See ELECTRIC RANGES.

Reinforced-Concrete. A New Patented Reinforced-Concrete Heating and Cooking Stove (Heiz- u. Kochofen aus Eisenbeton D.R.G.M. 730-790), A. Kern. Gesundheits-Ingenieur, vol. 43, no. 24, June 12, 1920, p. 280, 3 figs. Because of its thick walls it is practical in summer for cooking and heating food without overheating room, whereas in winter when well stoked it provides adequate heat and serves at the same time for cooking, keeping food warm and for supplying hot water for household purposes.

STRAIN GAGE

See BRIDGES, RAILWAY, Niagara Arch Bridge.

STRAW

Gas from. See PRODUCER GAS, Gas from Straw.

STREAM FLOW

Measurement. See RIVERS, Stream-Flow Measurement.

STREAM POLLUTION

Niagara River. Pollution of Niagara River by Wash Water from Filtration Plant Enjoined. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 52-59. Concerning court action to prevent pollution brought by water company against public water board, pollution in question being due to discharge of waste and wash water from water filtration plant.

STREET CARS

See STREET RAILWAYS, Cars.

STREET CLEANING

A. S. M. I., Report on. Street Cleaning, Refuse Disposal and Snow Removal, Geo. H. Norton. Can. Engr., vol. 38, no. 5, Jan. 29, 1920, p. 177. Report of Committee on Street Cleaning Refuse Disposal and Snow Removal presented before Am. Soc. for Mun. Improvements.

See also ROADS, Snow Removal.

Methods. Report on Investigation and Study of Methods of Street Cleaning, Collecting and Disposal of Municipal Waste in Other Cities—Recommendation and Plan of Procedure for Philadelphia, J. H. Neeson. Jl. Engrs. Club of Phila., vol. 37-8, no. 188, Aug. 1920, pp. 336-340. It is recommended that service of cleaning of streets, collecting ashes, rubbish and garbage should be given to the public at cost by municipal forces.

Report on the Study of the Methods of Street Cleaning and Collection and Disposal of Municipal Wastes, E. B. Morden, J. F. Follin and J. H. Neeson. Jl. Engrs. Club of Phila., vols. 37-8, no. 188, Aug. 1920, pp. 326-336. Data collected in inspection tour of 15 of principal cities of United States.

Snow Removal. See SNOW REMOVAL.

Sweeping Costs. Forms for Motor Sweeper Cost Keeping, John Townshend Child. Public Works, vol. 38, no. 18, May 15, 1920, pp. 417-419, 2 figs. Methods and forms devised in Rochester, N. Y., for keeping cost records of street sweepers for aid in controlling work, making budget estimates, comparing and purchasing equipment, and determining special assessments.

STREET RAILWAYS

American Industry. Argument and Brief Submitted to the Federal Electric Railways Commission on Behalf of the Committee of One Hundred Acting for the American Electric Railway Association. Aero, Nov. 22, 1919, 153 pp. Lack of credit is quoted as fundamental fact underlying present crisis of street railway industry. Causes of present conditions are set forth.

Boston. Boston—and Her Trolley Cars, Edward Hungerford. Elec. Ry. Jl., vol. 55, no. 21, May 22, 1920, pp. 1032-1037, 9 figs. How complications arising from narrow streets and topographical peculiarities of cities have been overcome. Rising tide of expenses, which threatened financial embarrassment of company, determined State to take over operation of property, guaranteeing fixed return to stockholders and to raise fare to ten cents.

See also Electric Braking.

Buses vs. See BUSES, Electric Railways vs.

Car Controllers. Electro-Magnetic, Walter S. Goll. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 49-57, 2 figs. Construction and operation of electric-car controller.

Car Operation. Economies in Car Operation, F. R. Phillips. Elec. Traction, vol. 15, no. 12, Dec. 15, 1919, pp. 815-821 and (discussion) 821-829, 2 figs. Concerning number of stops and slow-downs, density and regulation of traffic, speed of boarding and alighting from cars, etc.

Carbon Trolley Shoes. Carbon Trolley Shoes for Street Railway Operation (Kohleschleifstücke

im Strassenbahnbetrieb), H. Torau. Verkehrstechnik, vol. 37, no. 23, Aug. 15, 1920, pp. 324-325, 3 figs. It is claimed that the described defects of carbon shoes are easily corrected as soon as the trolley wire is polished to a smooth surface by the exclusive use of carbon shoes.

Cars. Construction Features of New Cars Now Building at Detroit. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 863-864, 10 figs. Special members are used in floor and side frame, and there are no bulkheads. Arch roof is in three units without headlining.

Modifying Open Cars for Prepayment Service. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 545-548, 8 figs. Building of cars for "pay-as-you-enter" operation.

Street Railways without Curve Friction (Strassenbahnwagen ohne Bogenreibung), Dr. Baseler. Zeitschrift für Kleinbahnen, vol. 26, no. 7, July 1919, pp. 344-349, 3 figs. Discussing construction with three axles.

See also CARS, Electric.

Cars, Converting. Open Trailers Converted into Desirable Closed Cars. Elec. Traction, vol. 16, no. 5, May 1920, pp. 331-332, 3 figs. Old-type open trailers in Memphis converted into closed cars at a cost of about $1500.

Cars, English. New Cars for Ilford Council Tramways. Tramway and Ry. World, vol. 48, no. 9, Aug. 19, 1920, pp. 81-83, 2 figs. Double-deck car. Dimensions: Length of body over corner posts, 18 ft. 6 in.; length of each platform, 5 ft. 6 in.; clear height at centre of lower unit, 6 ft. 9 in.; clear height at centre of upper unit, 6 ft. 4 in.; overall height over trolley plank, 16 ft. 6 in.; gage, 4 ft. 8½ in. Motors are of British Thomson-Houston G. E. 200 split frame, ventilated interpole type, of 35 hp.

Cars, Heating of. Thermostatic Control Saves Energy. Elec. Ry. Jl., vol. 55, no. 25, June 19, 1920, pp. 1245-1246, 4 figs. Comparison of results obtained with thermometer and hand control of car temperatures.

Cars, Manchester, England. Standard Car of the Manchester Corporation Tramways. Tramway & Ry. World, vol. 47, no. 14, Mar. 18, 1920, pp. 129-131, 4 figs. Double-deck bogie type with vestibule ends.

Cars, Non-Electric. Is the Non-Electric Street Railway Car a Serious Possibility? Ferdinand C. Cusani. Elec. Ry. Jl., vol. 55, no. 18, May 1, 1920, pp. 893-895. Writer believes that there is a field for self-propelled safety car, but considers steam power plant to be superior to oil or gas engine for purpose.

Cars, Peter Witt Type. New Motor and Trail Cars for St. Louis. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 551-552, 3 figs. Peter Witt type motor car with only two steps. Trailers are center entrance and exit, but front half of car is made a loading platform.

Cars, Safety. A "Foot Punched" Transfer. Elec. Ry. Jl., vol. 56, no. 15, Oct. 9, 1920, p. 723. Machine issued transfers without demanding use of both hands of platform men.

Accidents Lessened by Safety Cars, W. H. Burke. Elec. Ry. Jl., vol. 56, no. 10, Sept. 4, 1920, pp. 457-459. Statistics from group of Stone & Webster properties in widely separated section of country. Accidents on basis of car-mile or passengers carried have been less with safety cars than with two-man cars. Other statistics given.

Battery Cars Changed to Safety Cars, R. H. Parsons. Elec. Ry. Jl., vol. 56, no. 7, Aug. 14, 1920, pp. 311-314, 10 figs. Details of conversion of 50 storage-battery cars to safety cars for one and two-man operation by Third Avenue Railway, New York, for use in outlying districts.

New Standard Type of Safety Car Suggested, Wray T. Thorn. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 549-550, 1 fig. Separate entrance and exit, longitudinal seats at the ends and other changes recommended to make small one-man car better adapted to fairly heavy traffic lines.

One-Man Cars, Rail Sections, Corrugations, Differential Wages, and Depreciation Allowances, From Australian Experiences, P. J. Pringle. Tramway and Ry. World, vol. 48, no. 3, July 15, 1920, pp. 26-30 and (discussion) 30-33, 12 figs. Brief discussions of these various points.

Safety Car Operation, Henry S. Day and J. M. Dapron. Elec. Ry. Jl., vol. 56, no. 8, Aug. 21, 1920, pp. 350-354, 5 figs. Educational and practical methods which have been developed by Kansas City Railways, together with complete operating rules for safety cars, ninety-five of which are now being operated by this Company.

Safety Cars for Brooklyn. Elec. Ry. Jl., vol. 54, no. 17, Oct. 25, 1919, pp. 784-789, 16 figs. Overall length is 3 in. greater than standard safety car previously constructed. Other modifications are: Water table is pressed as integral part of letterboard; side posts are extended down over side sill; crown pieces are substituted for dasher angles and furring; and belt rails, ¼ in. by 1¾ in., are used instead of dropper bars.

Safety Devices of the Safety Car, Joseph C. McCune. Elec. Ry. Jl., vol. 55, no. 16, Apr. 17, 1920, pp. 788-793, 3 figs. Facts regarding fundamental characteristics of safety devices and principles of operation of various air-operated parts that constitute equipment.

Cars vs. Omnibuses. Street Passenger Transport of London, William Worby Beaumont. Jl. Roy. Soc. Arts, vol. 68, no. 3518, Apr. 23, 1920, pp. 368-375 and (discussion) pp. 275-380. Discussing problem of increasing transportation facilities of London, author states, from survey of records of operation of tramways and omnibuses, that greater convenience of latter, and their proved rapidity of loading and celerity of dispatch, makes it desirable to consider the total removal of tramways and operation of all surface passenger traffic with omnibuses.

Curves. Relation Between Wheel and Rail in Street Railways (Contribution à l'étude des relations entre les véhicles et les voies dans les tramways). Industrie des Tramways et Chemins de Fer, vol. 13, no. 154-155-156, Oct.-Nov.-Dec. 1919, pp. 146-153, 14 figs. Question whether gage should be widened or narrowed in curves of street railway track is discussed. It is found that shape of wheel flanges should determine practice to follow in any case. Equation expressing track gage in terms of characteristics of flanges, radius of curvature, etc., is derived and interpreted.

Electric Braking. Electric Braking on Street Cars and Modern Electric Street-Car Design (Zur Frage der rein elektrischen Bremsung der Strassenbahnwagen und über einen neuzeitlichen Motorwagenentwurf), E. Seefehlner. Elektrische Kraftbetriebe und Bahnen, vol. 17, no. 24, Aug. 24, 1919, pp. 185-189, 3 figs. Detailed description of new type of brake.

Elevated. See ELEVATED RAILWAYS.

Fares. Fares Are Seeking Higher Level, Harlow C. Clark. Aera, vol. 8, no. 7, Feb. 1920, pp. 783-814. Tables and a statement are presented of statistics and facts of situation of street railways in each city of more than 25,000 population in United States.

Fares in Chicago, Cleveland and Philadelphia Compared, L. A. Busby. Elec. Ry. Jl., vol. 54, no. 17, Oct. 25, 1919, pp. 795-796. Average

fare per passenger, that is, amount determined by dividing total passenger rates by total passengers carried—cash, transfer and free, computed for each of these cities. Although there is 7-cent fare in Chicago and 5-cent fare in other two cities, it develops that average fare per passenger in Chicago is 3.92 cents, 3.98 cents in Philadelphia and 3.7 cents in Cleveland.

The Future of Electric Railway, E. G. Lewis. Elec. Ry. Jl., vol. 56, no. 2, July 10, 1920, pp. 65-66. States that city public must determine for itself if it wants low fares or if it will continue to pay some of its taxes through railway fares.

See also Zone Fares.

Financing. The Equipment Trust Grows in Favor. Elec. Ry. Jl., vol. 55, no. 21, May 22, 1920, pp. 1047-1059, 3 figs. Instances are quoted of equipment for street railways being owned by local banks and leased to company. Such practice is said to be growing in favor and outlines are suggested for standardizing this method of purchasing rolling stock.

Franchises. The Municipality's Viewpoint in Electric Transportation, W. C. Culkins. Elec. Ry. Jl., vol. 55, no. 1, Jan. 3, 1920, pp. 10-13. Discusses character of present franchises and believes that greater flexibility is needed to meet altered conditions resulting from war.

Freight Cars for. Four-Axled Cars for Freight Transportation on Street Railway Tracks (Vierachsige Wagen für Güterbeförderung auf Strassenbahnen), H. Otto. Verkehrstechnik, vol. 37, no. 5, Feb. 15, 1920, pp. 66-67, 2 figs. Description of 5-ton metergage car constructed by firm of Krupp and now in operation. Dimensions: Maximum length above buffer head, 10,120 mm.; maximum width, 2000 mm.; height, 1200 mm.

Freight Traffic. Trolley Freight in New England, R. E. Cosgrove. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 750-752. Growth of trolley freight in New England. There are now 175 scheduled daily freight cars operating in New England over 1750 miles of track, giving employment to 850 people. Paper read before meeting of New England Street Ry. Club.

Gasoline-Driven Cars. A New Petrol-Driven Tramcar. Tramway & Ry. World, vol. 47, no. 3, Jan. 15, 1920, pp. 27-28, 4 figs. Engine is Dorman of 40-b.hp. Car can be driven from either end, being provided with control which can be removed from one end to other. General specifications of car are: Overall length, 26 ft. 6 in.; overall width, 6 ft. 9 in.; height overall, 9 ft. 4½ in.; wheel diameter, 2 ft. 3 in.; gage, 4 ft.

Jitney Competition. The Street Railway Outlook, H. C. Eddy. Elec. Ry. Jl., vol. 54, no. 14, Oct. 4, 1919, pp. 691-692. Further regulation for jitney, coupled with improved service of railway, recommended for dealing with jitney competition.

The Survival of the Fitter. Elec. Ry. Jl., vol. 56, no. 9, Aug. 28, 1920, pp. 412-414, 2 figs. Experience at Terre Haute, Ind. Jitney buses have dropped from 200 to 43 and have been forced to 10-cent fare during period when trolley cars have more than doubled in number and stayed at 5 cents in face of enormous increase in private automobiles.

Leakage Resistance of Roadbeds. Leakage Resistance of Street Railway Roadbeds and Its Relation to Electrolysis of Underground Structures, E. R. Shepard. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 127, Oct. 6, 1919, 39 pp., 10 figs. Roadbeds constructed with solid concrete ballast, vitrified brick, or other nonporous pavements, were found to have low leakage resistance to earth, and roadbeds constructed with foundation of clean, crushed stone under concrete paving base much higher resistance than roadbeds with solid concrete ballast. Other types were experimented with. Comparative results are given.

Municipal Ownership. Condition of the Electric Railways, J. H. Pardee. Elec. Ry. Jl., vol. 55, no. 26, June 26, 1920, pp. 1297-1300. Figures of Census Bul. of U. S. Bur. are quoted which show that municipally-owned railways operate at deficit. In spite of low taxes eight lines show deficit for year of $141,000 out of total operating revenues of $1,682,000.

Paving Between Tracks. See PAVEMENTS, WOOD-BLOCK, Street-Railway Tracks.

Philadelphia. Philadelphia Conditions Analyzed. Elec. Ry. Jl., vol. 54, no. 21, Dec. 20, 1919, pp. 999-1002, 2 figs. City director of transit Twining criticises recent Phila. Rapid Transit proposals and discusses five-cent fare situation in that city. Comparative figures are given with previous years and other cities.

Public Regulation. Service at Cost Agreements, Harlow C. Clark. Aera, vol. 8, no. 4, Nov. 1919, pp. 504-509. Analysis of various laws and ordinances which are now in effect in American cities.

Service-at-Cost Agreements. Service-at-Cost Agreements, Harlow C. Clark. Aera, vol. 8, nos. 5 and 6, Dec. 1919 and Jan. 1920, pp. 582-593 and pp. 723-728. Analysis of laws and ordinances of city of Montreal and in American cities. Provisions of Eastern Massachusetts Street Ry. Co.

Service-At-Cost Franchise. Cincinnati Director Reports. Elec. Ry. Jl., vol. 56, no. 10, Sept. 4, 1920, pp. 454-456, 3 figs. Report of first full year under Cincinnati service-at-cost franchise.

Snow and Ice Loads on Trolley Wires. Formulæ for Ice-Covered Trolley Lines (Aneisungsformeln), Robert Edler. Schweiz. elektrotechnischer Verein Bul., vol. 11, no. 8, Aug. 1920, pp. 207-214, 3 figs. Results of calculation of additional load caused by snow and ice.

Snow Removal. See SNOW REMOVAL.

Suburban Traffic. Handling Suburban Traffic at Congested Centers, C. Francis Harding. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 662-674, 19 figs. Experience and practice of Long Island Railroad are covered in detail and data for other roads which are handling dense suburban traffic are given.

Track Construction. Track Evolution in Edmonton. Elec. Ry. Jl., vol. 56, no. 10, Sept. 4, 1920, pp. 463-466, 8 figs. Description of several years' experience with various types of track construction in Edmonton, Alta., Canada, reviewing factors determining design of paving base, track drainage and paving.

Track Paving. How Cities of New York State Defeated Efforts of Street Railway Companies to Escape Cost of Car Track Paving, William P. Capes. Mun. and County Eng., vol. 59, no. 2, Aug. 1920, pp. 44-48. It is said that a nation-wide movement has been started by street-railway companies to repeal or modify laws and franchises requiring street railway companies to construct and maintain pavement between, and certain distance on either side of their tracks. Summary of argument which cities in New York State used before State Legislature in opposition to bill presented at last session is given.

Track Construction from the Paving Maintenance Standpoint. Elec. Ry. Jl., vol. 55, no. 12, Mar. 20, 1920, pp. 569-571, 7 figs. Experiences of Birmingham, Ala., Railway, Light & Power Co. with number of types of track construction in effort to reduce surface maintenance expense. Most satisfactory service is said to have been obtained with rigid concrete

substructure and vitrified brick paving, wherein paving between rails is so crowned that bricks adjacent to rails fit in underneath heads of T-rails avoiding use of any nose blocks.

Trackwork, Standard. Report on British Standard Special Trackwork for Tramways. British Eng. Standards Assn., no. 79, Dec. 1919, 36 pp., 29 figs. Diagrams are given illustrating various types of point, crossing and layout used in actual practice and standard title for each is suggested.

Trailers. One-Way Versus Two-Way Trailers. Elec. Ry. Jl., vol. 55, no. 23, June 5, 1920, pp. 1155-1156. It is claimed that majority of those having experience favor one-way trailers.

Valuation. Valuation and Accruing Depreciation. P. J. Kealy. Jl. Western Soc. Engrs., vol. 25, no. 1, Jan. 5, 1920, pp. 11-14. In opinion of writer future of traction companies lies along way to private operation based on cost of service, with sufficient public supervision to insure proper costs and adequate service.

Zone Fares. Basic Principles of an Equitable Zone Fare System. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 783-784. Advocates system of fares based on analysis of expenses with object of distributing fixed charges equally among all classes of riders and preventing congestion of population by making long journeys relatively cheaper than short ones.

The Connecticut Company Goes to Zone Plan. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 852-857, 10 figs. One of features is that in business center of each city "neutral" areas are provided to permit passengers to ride beyond geographical center in order to reach stores in central business region without paying extra fare.

[See also ELECTRIC RAILWAYS; SUBSTATIONS.]

STREETS

Cleaning. See STREET CLEANING.

Lighting. See LIGHTING, Street.

Pavements for. See PAVEMENTS.

St. Louis, Mo. Progress of the Major Street Plan in St. Louis, Harland Bartholomew. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 954-957, 7 figs. Avenue widened for one mile to give continuous five-mile thoroughfare between business and residential district at cost of $550,000. Widening street to 100 ft. for distance of 6½ miles to cost $2,250,000.

Signs and Signals. Road and Street Signs and Signals. Better Roads and Streets, vol. 9, no. 9, Sept. 1919, pp. 305-310, 22 figs. Discusses need of and benefit to be derived from standard road and street markings.

Two-Level. Chicago's New Two-Level Marginal Way, James Rowland Bibbins. Eng. World, vol. 17, no. 3, Sept. 1920, pp. 167-171, 5 figs. Improvement design to connect Michigan boulevard two-level bridge plaza, elevation 33.5 and 15.5 with Market Street and with west side bridges. Upper level street 110 ft. in width is coördinated with level of north river bridges, 21 ft., and lower level 135 ft. wide with dock level, 5 ft., 25 ft. being devoted to wharfage.

[See also ROADS.]

STRESSES

Distribution Around Circular Holes. Photo-Elastic and Strain Measurements of the Effects of Circular Holes on the Distribution of Stress in Tension Members, E. G. Coker, K. C. Chakko and Y. Satake. Eng., vol. 109, no. 2825, Feb. 20, pp. 259-264, 19 figs. Account of extension of some experimental work undertaken on transparent plates to find nature of distribution around circular hole. Paper read before Instn. Engrs. & Shipbuilders.

Engineering Materials, Distribution in. Stress Distribution in Engineering Materials. L. N. G. Filon. Engineering, vol. 109, no. 2819, Jan. 9, 1920, pp. 64-66, 4 figs. Principle of dynamical similarity applied to deformable elastic structures.

Measurement of. Photo-Elastic and Strain Measurements. Machy. (London), vol. 15, no. 390, Mar. 18, 1920, pp. 790-792, 7 figs. Effects of circular holes on distribution of stress in tension members. Paper read before Instn. of Engrs. & Shipbuilders in Scotland.

Recoverance. Stress Results within Elastic Limit. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 649-651, 2 figs. Recoverance is defined as capacity of material to return immediately the energy that has been imparted to it by any external force. Instruments for obtaining property are described and data on tests of different materials included.

Theoretical and Practical. A Call for a Practical View in Structural Teaching, Edward Godfrey. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 948-949, 2 figs. Deprecates taking too much care of theoretical unit stresses and disregarding such possible contingencies as buckling failure and excessive deflection.

STRIKES

See INDUSTRIAL RELATIONS, Strikes.

STRUCTURAL STEEL

Channel Sections. The Bending Strength of Channel Sections (Ueber die Biegungsfestigkeit von -Eisen), F. Wansleben. Eisenbau, vol. 11, no. 7, Apr. 9, 1920, pp. 143-145, 1 fig. Investigation of the distribution of stress in U-shaped sections in order to determine true load capacity of most generally used standard profiles.

Design. Stray Points in Structural Steel Design, R. Fleming. Eng. News-Rec., vol. 84, nos. 22 and 23, May 27 and June 3, 1920, pp. 1040-1042 and 1104-1106, 3 figs. Practical notes on spacing of tie rods in floors, weakening of beams by flange holes, excessive horizontal shear, use of average test results, and beam deflections. Discussion of friction and shear in riveted joints, effects of blind following of precedent; gives table of lattice-bar stresses and points in detailing that affect design.

Paints for. See PAINTS, Protective.

Preservative Coatings for. Report of Committee D-1, Annual Meeting, Am. Soc. Testing Matls., June 22-25, 1920, 32 pp., 4 figs. Theory of preservative coatings for structural materials. Tentative specifications for turpentine.

Specifications. Specifications for Carbon Steel Bars, Blooms and Billets for other Purposes than Machine Tools (Cahier des charges pour la fourniture de barres, blooms, billettes et largets en aciers au carbone autres que les aciers à outils). Revue de Métallurgie, vol. 17, no 7, July 1920, pp. 478-483. Specifications prepared by Commission Permanente de Standardisation.

Specifications for Low-Carbon Steel Bars, Blooms and Billets which are to be Later Case-hardened and Tempered (Cahier des charges pour la fourniture de barres, blooms, billettes et largets en acier à faible teneur en carbone pour cémentation). Revue de Métallurgie, vol. 17, no. 7, July 1920, pp. 474-477. Specifications prepared by Commission Permanente de Standardisation.

Specifications for Non-Tempering Carbon Steel Bars, Blooms and Billets (Cahier des charges pour la fourniture de barres, blooms, billettes et largets en aciers au carbone non trempants). Revue de Métallurgie, vol. 17, no.

7, July 1920, pp. 469-473, 1 fig. Specifications prepared by Commission Permanente de Standardisation.

Standard Shapes. Lists of British Standard Rolled Steel Sections for Structural Purposes. British Eng. Standards Assn., no. 1, 1920, 19 pp., 6 figs. Standards adopted in July 1920.

Standardization of Structural Shapes. Iron Age, vol. 106, no. 1, July 1, 1920, pp. 22-23, 3 figs. Also in Int. Mar. Eng., vol. 25, no. 8, Aug. 1920, pp. 659-661, 1 fig. Anglo-American standardization proposed by Structural Committee on steel shapes organized under auspices of Am. Eng. Standards Committee.

Wide-Flange Beams. Wide Flange Beams by the Sack Method. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 448-449, 8 figs. Results of German practice in producing shapes like those of Bethlehem mill. Roll design and theory of process. Translated from Stahl und Eisen.

STRUCTURES

Deterioration in Sea Water. Notes on the Deterioration of Structures in Sea Water, E. R. Matthews. Concrete & Constructional Eng., vol 15, no. 6, June 1920, pp. 392-395. Discussion of report of Instn. Civ. Engrs., with above title which is said to be most comprehensive ever issued by any committee, society or institution on any engineering subject.

Statically Indeterminate, Analyzing. Advantages of the Slope Deflection Method of Analyzing Statically-Indeterminate Structures, M. Grodsky. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 720-723, 10 figs. Analysis of two statistically-indeterminate structures of slope-deflection method. Reference is made to computation of same structure by least-work method in Eng. & Contracting, Sept. 24, 1919.

STUCCO

Application to Tile Wall. Stucco on Hollow Tile. Building Age, vol. 42, no. 2, Feb. 1920, pp. 20-25, 14 figs. Applications of stucco to exterior face of tile wall are illustrated.

Durable. Developments in Surface Treated Concrete and Stucco. J. C. Pearson and J. J. Earley. Concrete Products, vol. 18, no. 3, Mar. 1920, pp. 21-25, 7 figs. Experiments at Bureau of Standards are claimed to show that structurally sound and durable stucco can be secured by adherence to well-established practice. Paper read before American Concrete Inst.

Magnesite. Successful Building in Stucco. Am. Architect, vol. 117, no. 2319, June 2, 1920, pp. 711-714, 6 figs. Characteristics and application of magnesite stucco.

Standard Practice. Standard Recommended Practice for Portland Cement Stucco. Concrete, vol. 16, no. 3, Mar. 1920, pp. 134-140. Report of Committee on Treatment of Concrete Surfaces of Am. Concrete Inst.

Wall Construction. Successful Building in Stucco. Am. Architect, vol. 116, no. 2295, Dec. 17, 1919, pp. 767-774, 8 figs., and vol. 117, no. 2300, Jan. 21, 1920, pp. 89-93, 5 figs. Deals with wood lath on frame wall construction.

See also BUILDING CONSTRUCTION, Stucco.

STUDS

Tap-End Sizes. Tap-End Sizes of Studs. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 773-775. Question whether tap end should be tight on thread or depend on being jammed on last thread is discussed. Practice of two large companies making studs for the market is given.

STUFFING BOXES

Packings. Stuffing-Box Packings (Stopfbüchsenpackungen), Rudolf Ditmar. Kunststoffe, vol. 10, nos. 10, 12 and 15, May 11, June 11, and Aug. 1, 1920, pp. 107-109, 122-124 and 145-148, 6 figs. Gives details of numerous foreign and domestic patents and concludes with a table of patents arranged alphabetically according to patent owners.

SUBMARINE CABLES

Tests. Induction Disturbances in the Anglo-German Telegraph Cables and Their Elimination (Induktionsstörungen in den deutsch-englischen Telegraphenkabeln und Ihre Beseitigung), A. Kunert. Telegraphen u. Fernsprech-Technik, vol. 8, no. 12, Mar. 1920, pp. 202-216, 21 figs. Results of tests with the double-line operation show that the two cable loops by double Baudot ensure an entirely reliable operation, and with adequate improvement of the artificial lines they permit a triple and probably quadruple Baudot. Double-line operation is shown to be the best and simplest means of overcoming induction disturbances.

SUBMARINE MINES

Depth Meter. A Recording Submarine Depth-Meter, Gilbert Cook. Eng., vol. 109, no. 2828, March 12, 1920, p. 333, 1 fig. Instrument designed to record depth of sweep wire throughout its length in mine-sweeping operations over shallow British mine fields.

Drifting. See NAVIGATION, Floating Mines.

Number Laid During War. Submarine Mines in War, Reginald R. Belknap. Jl. U. S. Artillery, vol. 51, no. 5, Nov. 1919, pp. 455-471, 2 figs. To indicate growth of employment of mines, official bulletin is quoted as having stated in Nov. 1918 that 128,000 mines had been laid by the British during the war, 56,500 by the U. S. A. and about 20,000 by the Central Powers.

Paravanes as Protection Against. The Paravane, Robert F. McKay. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 389-392, 8 figs. Paravane installations are illustrated and their utility emphasized.

[See also MINE SWEEPING.]

SUBMARINE SIGNALING

Radius of Operation. Effect of Horizontal Temperature Layers of Sea Water on Radius of Sound Signals Under Water (Ueber den Einfluss horizontaler Temperaturschichtung des Seewassers auf die Reichweite von Unterwasserschallsignalen), H. Lichte. Physikalische Zeitschrift, vol. 20, no. 17, Sept. 1, 1919, pp. 385-389, 2 figs. Equations and curves showing radius of sound.

Sound Signaling. The Development and Present Status of Submarine Sound Signaling (Entwicklung und heutiger Stand des Unterwasserschall-Signalwesens), H. Lichte. Zentralblatt der Bauverwaltung, vol. 40, no. 39, May 15, 1920, pp. 249-253, 2 figs. Account of development of the electro-magnetically excited sender for fog signaling and other purposes, and its importance in navigation. Includes chart showing range of submarine sound signals.

SUBMARINE WARFARE

Anti-U-Boat Devices. Model Experiments in Connection with Submarine Warfare, G. S. Baker. Shipbuilding & Shipping Rec., vol. 15, no. 14, Apr. 1, 1920, pp. 437-439. Deals with efforts made to cope with submarine menace by means of nets hung in such channels as were used by enemy submarines. These nets are said to be of two kinds, one intended to merely indicate presence of submarines, the other to prevent submarine from passing net. Abstract of paper read at Instn. of Naval Architects.

Detection of Submarines. Detection of Subma-

rines, Harvey C. Hayes. Proc. Am. Philosophical Soc., vol. 59, no. 1, 1920, pp. 1-47, 18 figs. Research and development work carried out by two groups of scientists, one group backed by private companies, the other by the U. S. Navy. Types of submarine detectors developed by England, France and United States.

Nets. The Fort Monroe Submarine Net. Stuart A. Hamilton. Jl. U. S. Artillery, vol. 52, no. 6, June 1920, pp. 528-552, 18 figs. 1 on supp. plate. Discussion of construction, planting, maintenance, and removal of submarine nets of type designed at Torpedo Depot, Fort Totten, N. Y., with subsequent minor changes. It is not deemed advisable to install gate section in any submarine net unless it is intended immediately to close that passageway; and it is believed that in future no pilings should be driven at ends of net, but that in lieu thereof a mooring buoy be planted with ground tackle similar to that on other mooring buoys of net.

SUBMARINES

British. H. M. Submarine L33. Engr., vol. 129, no. 3345, Feb. 6, 1920, p. 139, 1 fig. Gun is placed on revolving platform on conning tower instead of being fitted on forward deck. Other change is installation of battery of torpedoes.

Compressed Air, Uses of. The Uses of Compressed Air in the Modern Submarine, Yates Stirling. Compressed Air Magazine, vol. 25, no. 7, July 1920, pp. 9705-9711, 19 figs. Supply of air necessary for breathing, ejecting torpedoes and blowing ballast tanks is stored in flasks at 2500-lb. pressure.

Detection. Submarine Detection in an Alternating Magnetic Field, J. B. Whitehead and L. O. Grondahl. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 223-234. Account of tests of disturbance caused in uniform magnetic field by incoming magnetic mass conducted at Johns Hopkins University and U. S. Naval Acad. with a view to developing device for detection of enemy submarines. Equipment was developed which, it is asserted, by sufficient increases in size would be capable of detecting steel vessel 200 ft. long at distance of 500 ft. Weight of equipment required about 8000 lbs.

Electric Steering. Electric Rudder Engines on U-Boats, Their Development and Adaptability for Large Warships and Merchant Ships (Die elektrischen Rudermaschinen auf U-Booten, ihre Entwickelung und Anwendung für grössere Kriegs- und Handelsschiffe). Schiffbau, vol. 21, nos. 5 and 6, Dec. 10 and 24, 1919, pp. 220-228, 36 figs. Studies of advantages and disadvantages, based on several years' experience, of original electric rudder machines and their gradual development. Details of pilot switch and direct automatic steering.

English. English Submarines during the War and the Battle against the German Submarines (Les sous-marins anglais pendant la guerre et la lutte contre les sous-marins allemands), A. Poidlouë. Génie Civil, vol. 76, no. 4, Jan. 24, 1920, pp. 85-89, 10 figs. English type. Specifications are: Length, 55.15 m.; breadth, 6.95 m.; depth, 3.85 m.; displacement, 662 tons; power plant, 1600 hp.

European Types. Submarines (Les sous-marins), A. M. Laubeuf. Revue de l'Ingénieur et Index Technique, vol. 26, no. 5, May 1920, pp. 491-521, 21 figs. Description of French, English and German types.

German. German Submarines (Les sous-marins allemands), M. Laubeuf. Mémoires et Compte rendu des Travaux de la Société des Ingénieurs Civils de France, vol. 73, nos. 1-2-3, Jan.-March 1920, pp. 27-64, 34 figs. partly on 3 supp. plates. Submarines, it is said, proved serviceable for coast protection and reconnaissance work. It is urged that three types be built in France: cruisers of 900 tons, coast guards of 500 tons, and mine layers of 500 tons.

The Construction of U-Boats in the Germania Shipyard (Der Bau von Unterseebooten auf der Germaniawerft), H. Techel. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, nos. 43 and 52, Oct. 25 and Dec. 27, 1919, pp. 1049-1057 and 1302-1310, 59 figs., also vol. 64, nos. 8, 35 and 37, Feb. 21, Aug. 28 and Sept. 11, 1920, pp. 173-181, 691-696 and 742-744, 45 figs. Brief historical review. General description of a modern submarine; weight and buoyancy of the submerged boat; steering under water. Discussion of motive power for navigation under and above water; details of the Körting type of marine oil engine. Details and illustrations of the 200-hp., 300-hp., 530-hp., 1700-hp. and 1200-hp. 4-stroke engines, the 850-hp., 1100-hp., 1150-hp. and 1650-hp. 2-stroke engines, and the engines for the merchant submarines Deutschland and Bremen. Investigation of comparative merits of 2- and 4-stroke systems. Switch gear and electric motors. Accumulator batteries.

See also INTERNAL-COMBUSTION ENGINES, German Submarines.

German, Engines for. See INTERNAL-COMBUSTION ENGINES, German Submarine.

Minelayers, German. German Submarine Minelayers. Engr., vol. 129, no. 3356, April 23, 1920, pp. 415-416. Tables giving general characteristics and weights and percentages of displacements of classes UC-I, UC-II and UC-III. Translated from Schiffbau.

Naval Warfare, Use in. The Influence of the Submarine in Naval Warfare in the Future, C. M. Faure. Jl. Roy. United States Service Instn., vol. 64, no. 456, Nov. 1919, pp. 563-582. Urges use of submarine by Great Britain to preserve her supremacy of naval power. It is argued that to abolish the submarine would be to compromise, which is "fatal for strategy." If war is to be abolished, it is observed, "idealists should banish all armaments."

Navigation of. See NAVIGATION, Submarines, Navigational Obligations.

Radiotelegraphic Equipment. See RADIOTELEGRAPHY, Submarines, Equipment of.

Signaling. Submarine Signaling, Hammond V. Hayes. Engr., vol. 129, no. 3359, May 14, 1920, pp. 491-493, 8 figs. States that three problems were involved in development of receiving apparatus; (1) production of suitable under-water sound-receiving devices; (2) reduction or elimination of noises which interfere with reception of sounds coming from distance; and (3) means for ascertaining direction from which distant sounds are coming. Details of under-water sound-sending and sound-receiving devices used during war, by use of which, it is claimed, the bearing of every ship within a range of several miles can be found.

Trimming. Rapid Trimming of Submarines between Two Strata of Water, Eugenio Normand. Shipbuilding & Shipping Rec., vol. 15, no. 23, June 3, 1920, p. 740. It is set forth that change of buoyancy due to temperature must always be considered if it is desired to effect rapid trimming of submarine, and this can be obtained by measuring temperature of sea at different depths by means of thermometer inserted through side of conning tower, vessel being maneuvred in depth until zone of water is reached where changes of temperature are not very sudden.

[See also NAVIGATION, Submarine.]

SUBPRESSES

See PRESSES, Sub-Press Design.

SUBMERGENCE

Land. See RAILWAY CONSTRUCTION, India.

SUBSTATIONS

Automatic. Automatic Railway Substations. Gen. Elec. Co., Schenectady, N. Y., bul. no. 44092B, Oct. 1919, 16 pp., 13 figs. General description of an automatic railway substation. Data of operation of various stations are given as example of economies effected by their installation.

Automatic Substations at Des Moines, F. C. Chambers. Elec. Ry. Jl., vol. 55, no. 15, Apr. 10, 1920, pp. 738-744, 7 figs. Installation of first two units is said to have averted need of new feeder cable and permitted salvage of existing cable. Details of overhead system showing feeder and return systems as actually installed and in operation with seven automatic substations; total amount of copper, 460,000 lb.

Automatic Substations for Heavy City Service, R. J. Wensley. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 4, April 1920, pp. 359-364, 3 figs. Development of automatic substations has been chiefly in connection with street railway systems. Paper discusses this service and points out further developments.

Automatic Substations for Street-Lighting Service, F. A. Vaughn. Elec. Rev. (Chicago), vol. 77, no. 7, Aug. 14, 1920, pp. 236-239, 7 figs. Present developments in street-lighting design and operation in city of Milwaukee. Extracts from paper before Western Society of Engineers and Illuminating Engineering Society.

Automatic Substations on the Pacific Electric. Elec. Ry. Jl., vol. 55, no. 5, Jan. 31, 1920, pp. 248-250, 7 figs. It is said that automatic operation insures load uniformity and increased power economies.

The Cleveland Railway Commissions Its First Automatic Substation. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 532-536, 11 figs. Substation contains two 1500-kw. Westinghouse rotary converters, each equipped with circuit breakers, transformers and automatic control equipment.

California. Substation Construction in Southern California, J. A. Lighthipe. Elec. World, vol. 74, no. 21, Dec. 20, 1919, pp. 1110-1112, 4 figs. Features of Torrance and Eagle Rock substations recently built by Southern California Edison Co. to help take care of expanding load.

Cost. Substations for Supplying Large Industries, R. H. Tillman. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 231-233, 5 figs. Simplicity in arrangement and wiring is important factor to be considered in design and installation. Typical substations vary in cost from approximately $11 to $38 per kva. of installed capacity.

Duquesne Light Company, Pittsburgh. North Substation of Duquesne Light Company, Pittsburgh. Elec. Rev. (Chicago), vol. 75, no. 26, Dec. 27, 1919, pp. 1045-1047, 5 figs. Outdoor substation used for feeding 22,000-volt lines from 66,000-volt network and sectionalizing latter.

Railway, Automatic. Automatic Railway Substations, Frank W. Peters. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 267-274, 8 figs. Reviews range of conditions to which railway automatic substations have been applied and discusses economies and operating advantages effected by their use. Description is given of modern equipment with details of its operation. Special reference is made to improvements in design of control apparatus, to positive sequence of starting machines and protection afforded apparatus against overloads or other irregularities either outside or internal to stations.

Short-Circuit Protection. Short-Circuit Protection for Direct-Current Sub-Stations, J. J. Linebaugh. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar. 1920, pp. 274-278, 12 figs. Improvements mentioned include refinement and perfection in details of flash barriers; design of high-speed circuit breaker for both substations and electric locomotives; high-reluctance commutating pole for 60-cycle synchronous converters; and design of protection brush holder. Analysis of conditions during short-circuits is shown by photographs, oscillographs and diagrams. Special reference is made to operating results on electric zone of C., M. & St. P. R. R.

Short-Circuits, Limiting. Limiting Substation Short-Circuits, R. F. Gooding. Elec. World, vol. 75, no. 14, Apr. 3, 1920, pp. 771-773, 4 figs. Calculations are made to show best arrangement of reactances at substation tapping tie lines between two generating plants. Mechanical forces acting upon bus supports are also determined.

SUBSTITUTE MATERIALS

See MACHINE CONSTRUCTION, Substitute Materials.

SUBWAYS

Automatic Route Indicator. The Silent Guide Automatic Route Indicator. Engr., vol. 129, no. 3355, April 16, 1920, pp. 408-409, 3 figs. Chart provided with electric connections and lamps. By pressing push button placed opposite name of station in list on side of map, lamp at position of station on map is lighted and route to take to reach it is indicated by color scheme.

Cars. See CARS, PASSENGER, London Subway.

Cleveland. Rapid Transit for Cleveland, Henry M. Brinckerhoff. Elec. Ry. Jl., vol. 55, no. 17, April 24, 1920, pp. 856-858, 2 figs. Outline of project involving construction of subway.

London, Cars for. New Rolling-Stock for the Bakerloo. Ry. Gaz., vol. 32, no. 15, April 9, 1920, pp. 554-557, 4 figs. Cars of London and Northwestern lines. Dimensions are: Length overall, 50 ft. 10 in.; width over body, 8 ft. 8 in.; total height from rail, 9 ft. 5 in.; diameter of motor wheels, 42 in.; diameter of trailing wheels, 32 in.; total weight of six-car train unloaded, 161 tons 2 cwt.

New Types of Cars on the Metropolitan and District Railways. Tramway & Ry. World, vol. 47, no. 8, Feb. 12, 1920, pp. 69-72, 5 figs. Car used on underground and suburban railways of London. It has five side doors for rapid movement of passengers.

Madrid. The Madrid "Metro." Ry. Gaz., vol. 31, no. 24, Dec. 12, 1919, pp. 775-777 and 781, 9 figs. Description of underground railway in Spain.

The Underground Railway of Madrid (Le métropolitain "Alphonse-XIII" de Madrid), J. Eugenio Ribera. Génie Civil, vol. 76, no. 10, Mar. 6, 1920, pp. 251-254, 9 figs. Total length of line is 3839 meters. Stations are placed at average distance of 500 m. Maximum grade is 40 mm. per m. and minimum radius 90 m.

Maintenance. Engineering Maintenance on Underground Railways, A. R. Cooper. Ry. Engr., vol. 41, nos. 481, 482 and 483, Feb., Mar. and Apr. 1920, pp. 57-62, 98-105 and 163-166, 33 figs. Features of organization and detail work necessary to give prompt attention to breakdowns or defects that may interfere with train service. Based on practice of London and New York underground electric railways. Paper read before Permanent Way Institution.

Signaling. Electric Signaling in the Paris Underground Railway (La signalisation électrique du chemin de fer métropolitain de Paris), M. Koch. Électricien, vol. 35, no. 1253, June 1, 1920, pp. 225-229, 8 figs. Block-system is used. Schemes of connection are given.

Stations, Grouting of. Leaking Subway Station Successfully Grouted, M. H. Freeman. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 314-318, 3 figs. Inflow of more than 150 gal. per min. through broken joints in waterproofing checked by grout injection through pipes tapping leaking points.

Sydney, Australia. New Rapid Transit Railway for Sydney, Australia. Eng. News-Rec., vol. 85, no. 2, July 8, 1920, pp. 56-58, 1 fig. Account of electric underground and elevated city loop to connect suburban lines and relieve street-car congestion. Information obtained through Railway Commissioners.

SUGAR

Analysis. The Double-Polarization Method for Estimation of Sucrose and the Evaluation of the Clarget Divisor, Richard F. Jackson and Clara L. Gillis. Dept. of Commerce, Sci. Papers, Bur. of Standards, no. 375, March 30, 1920, pp. 125-194, 2 figs. Velocity of inversion of sucrose was measured at temperatures from 20 to 90 deg. cent. and was found to follow exponential law proposed by Arrhenius. Rates of reaction were measured for three different concentrations of hydrochloric acid. Time required under different conditions to produce 99.99 per cent inversion is computed and tabulated.

Beet. Progress in the Production of Beet Sugar in 1919 (Fortschritte der Rübenzucker-Fabrikation 1919), Edmund O. von Lippmann. Chemiker-Zeitung, vol. 44, no. 4, Jan. 8, 1920, pp. 25-27. Notes on agricultural developments, new technical apparatus used in manufacture of beet sugar, chemical analyses, and status of world production since 1914.

Centrifugals. See CENTRIFUGALS.

Manufacture. Description of the Maffra Sugar Factory, Vic., R. T. Trinder. Chem. Eng. & Min. Rev., vol. 12, no. 140, May 5, 1920, pp. 303-306, 3 figs. Notes on carbonatation, filtration, sulphitation, mechanical filters, separation, drying, bagging, etc.

See also CENTRIFUGALS.

Solvent Action of Water on. Action of Sucrose Solutions on Crystals, Albert Marien. Sugar, vol. 22, no. 8, Aug. 1920, pp. 443-444. Mathematical relations of factors involved in solvent action of water on sugar in their practical relation to sugar factory problems.

[See also SACCHARIMETERS; SACCHAROSE.]

SULPHIDE METALS

Reduction. Reduction of Sulphide Metals and Physical Chemistry, K. Shimada. (In Japanese.) Chem. Technology, vol. 3, no. 9, Sept. 1919.

SULPHUR

Boiling Point, Standardization. Standardization of the Sulphur Boiling Point, E. F. Mueller and H. A. Burgess. Dept. Commerce, Scientific Paper of Bur. of Standards, no. 339, 1919, pp. 163-184, 4 figs., partly on two supp. plates. Work of Meissner showed that reflecting power of inner surface of radiation shield may have considerable effect upon temperature assumed by resistance thermometer in sulphur boiling periods, is confirmed and extended.

Production in 1919. See MAGNESITE, Production in 1919.

Viscosity of. On the Viscosity of Sulphur, C. Coleridge Farr and D. B. MacLeod. Proc. Roy. Soc., vol. 97, no. A682, Apr. 1, 1920, pp. 80-98, 6 figs. It was found in experiments that viscosity of purified (twice distilled but not gas-free) sulphur has value at 123 deg. cent. of 0.1094 c.g.s. units. It falls to minimum of 0.0709 at 150 deg. cent. and then gradually rises to about 159 deg. cent., when rise becomes more marked, but no strict transition point is noticeable.

SULPHURIC ACID

Contact Process. The Thermal Problem in Contact Sulphuric Acid Manufacture, F. C. Zeisberg. Gen. Meeting Am. Electrochem. Soc., paper no. 16, Sept. 26, 1919, pp. 195-202. Present state of art of contact, sulphuric acid manufacture and its relation to various methods of cooling.

Freezing Point. The Freezing Point of Mixtures of Sulfuric and Nitric Acids, W. C. Holmes. Jl. Indus. and Eng. Chem., vol. 12, no. 8, Aug. 1920, pp. 781-783, 3 figs. Freezing-point determinations were made on three sets of mixtures of sulfuric and nitric acids, having total acidities of 100, 95, and 103 per cent, respectively, and nitric contents varying from zero to 50 per cent.

Manufacture. Manufacture of Sulphuric Acid by the Chamber Process, M. Kaltenbach. Chem. Age (N. Y.), vol. 28, no. 8, Aug. 1920, pp. 295-301, 2 figs. Statistics on production, temperatures, yields and consumption of raw materials are presented and analysis is made of these figures by striking thermal balances. Conclusions are derived, and modifications are suggested to remove defects of process. Translated from Chimie et Industrie.

Raschig's Rings in the Acid Industry (Raschigs Ringe in der Säureindustrie), Hugo Schellhaass. Chemiker-Zeitung, vol. 44, no. 18, Feb. 10, 1920, pp. 122-123, 1 fig. Describes superior qualities of Raschig's rings used in the production of sulphuric, nitric and hydrochloric acids, etc. They are described as small hollow cylinders of porcelain, 25 mm. high, 25 mm. outside diam., 2 mm. wall thickness, which are not placed regularly in the mixing towers, but thrown in haphazardly, the advantages of this irregular grouping being explained.

See also Contact Process; COAL, Pyrite, Use of.

Production in 1919. See MAGNESITE, Production in 1919.

Specific Heat. Specific Heat of Sulphuric and Nitric Acids and of Their Mixtures (Chaleur specifique des acides sulfuriques, des acides nitriques et de leurs mélanges), Paul Pascal and Garnier. Bulletin de la Société chimique de France, vols. 27 and 28, no. 1, Jan. 5, 1920, pp. 8-18, 5 figs. Tables are presented giving results of experiments performed by electrical method.

SUN

Radiation from. See RADIATION, Solar.

SUPERCHARGERS

See AEROPLANE ENGINES, Superchargers for.

SUPERCHARGING

See AEROPLANE ENGINES, Supercharging.

SUPERHEAT

Advantages of. Advantages of Superheat Steam Operation, D. D. Pendleton. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 350-353, 2 figs. Advantages are said to be considerable reduction in cost of operating steam plant, and increase in economy.

SUPERHEATED STEAM

Consumption by Prime Movers. Factors Governing the Advisability of Using Superheated Steam, A. H. Randolph. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1053-1054. Including tables showing ranges in steam consumption by various prime movers.

Use in Power Plants. The Use of Superheated Steam in Power Plants. Power Plant Eng., vol. 24, no. 14, July 15, 1920, pp. 694-696, 2 figs. Economy of superheat in increased boiler efficiency, increased plant capacity, reduction in condensation losses and reduction in steam consumption of prime mover. Effects on piping and fittings and types of superheaters discussed.

SUPERHEATERS

Economy Obtained with. Superheaters and the Utilization of Superheated Steam, D. D. Pendleton and C. A. Brandt, Proc. Engrs. Soc. Western Pennsylvania, vol. 36, no. 1, Feb. 1920, pp. 25-53, and (discussion) pp. 53-79. Economy obtained with superheaters is pointed out together with increase of boiler efficiency resulting from their use, and reference is made particularly to importance of using superheaters in steam turbines. Various types of superheaters are described and requisites of ideal superheater are worked out.

Manufacture. The Fabrication of the Return-Bend Portions of U-Shaped Superheater Tubes (Die Herstellung der Umkehrstücke U-förmiger Ueberhitzerröhre), H. Theobald. Metall, vol. 1919, nos. 20 and 21, Oct. 25 and Nov. 10, 1919, pp. 271-274 and 288-290, 51 figs. Notes on method for producing hood from two parallel tubes with connecting bar; producing double hood by joining two tubes; forming hood and tube connecting branches from flat tubing; forming reversing part from a whole working piece, and various other processes.

Marine Type. The North-Eastern Superheater. Steamship, vol. 32, no. 374, Aug. 1920, pp. 35-39, 5 figs. Type developed by North-Eastern Marine Eng. Co., Ltd., Wallsend-on-Tyne, England. It consists of headers arranged in pairs between nests of boiler tubes.

Steam Velocities in. Steam Velocities and Pressure Drop in Superheaters, H. B. Oatley. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 824-825. Advantages resulting from use of high steam velocities.

SUPERPOWER PLAN

See CENTRAL STATIONS, Superpower.

SUPERPOWER STATIONS

See STEAM-ELECTRIC PLANTS, Superstations.

SURFACE COMBUSTION

See COMBUSTION, Surface.

SURFACES

Double Curve Systems. Certain Double Systems of Curves on a Surface, Tsuruichi Hayashi. Sci. Reports Tôhoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 215-220. Systems where sum of geodesic torsions in conjugate directions becomes critical along asymptotic lines.

Ruled. Ruled Surfaces of Fourth Order having Two Double Straight Lines (Sur les surfaces réglées du quatrième ordre à deux droites doubles), Octave Mayer. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 20, Nov. 17, 1919, pp. 899-902. Their equation with reference to twelve tetrahedrons formed by their eight pinch points.

SURVEYING

Aerial Photography. Hydraulic Survey by Aerial Photography (Application de la Photographie aérienne aux levés hydrographiques), J. Volmat. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 17, Oct. 27, 1919, pp. 717-718. Work done under auspices of French navy.

See also AERIAL PHOTOGRAPHY.

Aeroplanes in. The Airplane in Surveying and Mapping, E. Lester Jones. Jl. Engrs. Club of St. Louis, vol. 4, no. 3, May-June 1919, pp. 218-232. Work of surveying by aeroplane is reviewed and opinion is expressed that aeroplane "can now furnish maps of a low order of accuracy so far as scale and position of features are concerned," and it "will undoubtedly be extensively used in unmapped areas in this and other countries in the very near future."

Chains. See CHAINS, SURVEYORS'.

Hydraulic. See Aerial Photography.

Leveling. See LEVELING.

Mine. See MINES, Surveying.

Phototopographic. See PHOTOTOPOGRAPHY, Aerial.

Rectangular-Coördinate. Rectangular Coördinates Used in Surveys and Maps, H. A. Foster. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 962-963, 1 fig. Grid system based on Lambert projection, employed by armies in France, is recommended for civilian practice.

Stadia. Sextant and Stadia-Rod Method for Measuring Distance, B. A. Baird. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 647-648. How topographic mapping of Alaska coast line was facilitated by special stadia.

Triangulation. Triangulation Simplified by Army Coördinate System, H. A. Foster. Eng. News-Rec., vol. 84, no. 21, May 20, 1920, pp. 1006-1011, 14 figs. Adaptation of French military methods of applying to surveying and mapping a system of rectangular coördinates based on Lambert conformal conic projection. See also Eng. News-Rec., May 13, 1920, p. 962.

[See also AEROPLANES, Surveying and Mapping; MAPPING; THEODOLITES.]

SUSCEPTIBILITY

See MAGNETIC SUSCEPTIBILITY.

SUSPENSION BRIDGES

See BRIDGES, SUSPENSION.

SWAGING MACHINES

Dies. The Swaging Machine and Toolroom Methods of Making the Dies, W. E. Thompson. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 275-277, 7 figs. Toolroom method for producing dies used in swaging machine and for reducing and shaping steel and other wires.

Langelier. The Langelier Hot Swaging Machine, E. L. Dunn. Am. Mach., vol. 52, no. 15, April 8, 1920, pp. 790-791, 6 figs. Two oppositely disposed swaging dies are carried in spindle head and are caused to open and close rapidly as spindle revolves. Dies deliver 900 blows per minute, and the work is thus swaged into shape as it is fed into dies.

Rotary. The Rotary Swaging Machines and Their Work, E. A. Suverkrop. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 973-978, 11 figs. Description of various types and illustration of hot and cold swaging operations on tubular and solid stock.

[See also MACHINE TOOLS, Special.]

SWIMMING POOLS

Concrete. An Open-Air Swimming Pool in England, John Y. Dunlop. Am. Architect, vol. 116, no. 2294, Dec. 10, 1919, pp. 735-738, 5

figs. Pool is 150-ft. long, 60-ft. wide and is formed in concrete, lined on inside with bituminous sheeting and faced with white enameled brick and finished with round-edged cut-stone coping.

Large, Cost of. Cost of 595 x 340 Ft. Outdoor Swimming Pool at Baltimore, Md. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 664-665, 1 fig. Bath is elliptical in shape with maximum depth of 9 ft. and minimum of 3 in.; capacity is 4,500,000 gal.

[See also WATER PURIFICATION, Ozonizing Plant.]

SWING BRIDGES

See BRIDGES, SWING.

SWITCHBOARDS

British, Safety Features. Safety Features of British Switchgear, B. E. G. Mittell. Elec. World, vol. 75, no. 6, Feb. 7, 1920, pp. 309-312, 11 figs. Switchboard designs are described as sheet-metal-inclosed and complete draw-out types and compromise between these two known as truck type. Details of first two are given.

Central-Station. Notes on the Specification of A. C. Switchgear for a Municipal Generating Station, A. E. Val Davies. Trans. South African Inst. E.E., vol. 10, part 12, Dec. 1919, pp. 184-191 and (discussion) pp. 191-195. Scheme involves two separate systems, one 2200-volt 2-phase and one 1100-volt 3-phase.

Dead-Front. Modern Practice in Industrial Switchboard Design, D. H. Colcord. Elec. Rev. (Chicago), vol. 76, no. 6, Feb. 7, 1920, pp. 228-230, 6 figs. Flexibility and safety obtained, writer claims, by use of dead-front switchboards of unit construction. Typical installations are described and illustrated.

Meter Connections. Switchboard Meter Connections for Alternating-Current Circuits J. C. Group. Elec. Jl., vol. 17, nos. 7 and 8, July and Aug. 1920, pp. 281-284 and 355-356, 16 figs. Measuring reactive volt-amperes in a three-phase three-wire circuit.

See also ELECTRIC METERS, Switchboard Connections.

Testing-Laboratory. Polyphase Experimental and Instrument-Testing Table, H. P. Sparkes. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 380-381, 2 figs. Switchboard used in testing laboratory of Westinghouse Electric & Manufacturing Company for polyphase experiment tests.

[See also ELECTRICAL APPARATUS, Testing; STREET RAILWAYS, Switchboard Connections.]

SWITCHES

Electric. See ELECTRIC SWITCHES.

Railway. See RAILWAY SWITCHES.

SYMBOLS

Aeronautical. Uniformity in Symbols, Alexander McAdie and George P. Payne. Science, vol. 50, no. 1296, Oct. 31, 1919, pp. 411-412. Suggested standardization of symbols used in aerography and aeronautical engineering.

SYNCHRONOUS COMMUTATOR

See ELECTRICAL MEASUREMENTS, High Alternating Voltages.

SYNCHRONOUS MOTORS

See ELECTRIC MOTORS, A.C., Synchronous.

T

TALC

Mining. Talc Mining and Milling at Madoc, Ontario, Raymond B. Ladoo. Reports of Investigations, Bur. of Mines, Dept. of Interior, serial no. 2162, Sept. 1920, 5 pp., 2 figs. Comparison with methods employed in United States.

Uses. The Uses of Talc and Soapstone, Raymond B. Ladoo. Chem. & Metallurgical Eng., vol. 23, no. 6, Aug. 11, 1920, pp. 235-236. Also in Cement, Mill and Quarry, vol. 16, no. 12, June 20, pp. 25-27. Summarized list of present and possible future uses of powdered and massive talc and soapstone, with brief analysis of factors upon which their more extensive use depends.

TANKERS

See MOTORSHIPS, Oil Tankers; TANK STEAMERS.

TANK STEAMERS

10,000-Ton. 10,000-Ton Oil Tank Steamship. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 272-274, 8 figs. Dimensions: Length overall, 439 ft. 7 in.; length between perpendiculars, 424 ft.; beam molded, 58 ft.; draft 25 ft. 5 in.; deadweight tonnage, 10,000 tons; service speed, 10½ knots. Propulsion is by single screw of four-bladed built-up type driven by vertical inverted triple-expansion surface-condensing engine.

Turbine-Driven. Oil Tank Steamer "San Fernando." Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 76-78, 11 figs., partly on three supp. plates. Also Engineer, vol. 128, no. 3338, Dec. 19, 1919, pp. 605-607, 3 figs. Specification: Overall length, 547 ft.; breadth, molded, 69 ft.; depth, molded, 42 ft. 3 in.; draught, 30 ft. 8¼ in.; deadweight, 18,550 tons. Vessel is propelled by turbines of Brown-Curtis type.

TANKS

Aeroplane Gasoline. See AEROPLANES, Gasoline Tanks.

Concrete. Concrete Tanks for Industrial Purposes. Contract Rec., vol. 33, no. 53, Dec. 31, 1919, pp. 1211-1212. Construction requirements of concrete tanks for storage of mineral oils, brine, molasses, vegetable and animal oils and chemicals.

The Handling of Cocoanut Oil, Charles W. Geiger. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 121-126, 8 figs. Description of Philippine Vegetable Oil Co.'s storage plant, including constructional features of reinforced-concrete storage tanks.

Construction. Tank Construction, Ernest G. Beck. Mech. World, vol. 66, nos. 1714 and 1717, Nov. 7 and 28, 1919, pp. 223-224 and 259, 10 figs., and vol. 67, nos. 1725, 1729 and 1744, Jan. 23, Feb. 20 and June 4, 1920, pp. 54-55, 120-121 and 357-358, 18 figs. Trough-bottomed rectangular tanks and cylindrical tanks. Discussion of hoop tension, hemispherical bottoms, hoop stresses, dished bottoms and substructures and foundations.

Cylindrical, Roofs of. See Construction.

Dished-End, Gaging. Computation of Gauge Tables for Horizontal Tanks, Carl D. Miller. Oil News, vol. 8, no. 12, May 20, 1920, pp. 26-30, 4 figs. Computation of volumes of tanks with dished ends is said to be complex, and newly

developed formula is given presenting simple method.

Freezing. See ICE PLANTS, Freezing Tanks.

Military. See TANKS, MILITARY.

Oil. See Concrete; also OIL TANKS, Concrete.

Reinforcing Rings. Calculation of Stresses in Reinforcing Rings of Overhead Tanks (Berechnung des Normalspannungen in den Aussteifungsringen von Hochbehältern auf Einzelstützen), Constantin Weber. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 40, Oct. 4, 1919, pp. 978-983, 32 figs. Errors in J. Schmidt's formulæ are pointed out which are admitted by him, and author endeavors to correct such errors and explain doubtful points.

Water. See WATER TANKS.

Wooden. See WATER METERS, Railway Water Service.

TANKS, MILITARY

Caterpillars. Caterpillars and Their Construction, K. H. Condit. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 601-604, 5 figs. Brief history of work of the Holt "caterpillars" for the Allies.

TANKSHIPS

See SHIPS, CONCRETE, Oil Tankers; MOTORSHIPS, Oil Tankers; TANK STEAMERS.

TANNERIES

Waste Purification. See WASTE UTILIZATION, Tanneries.

TANSIA WORK

Methods. A New Art Industry, Eugene Werner. Metal Industry (London), vol. 15, no. 25, Dec. 19, 1919, p. 515. Modern methods of carrying out tansia-work. Translated from Galvanoplastic und Metallbearbeitung.

TAPPING MACHINES

Multiple-Spindle. Foote-Burt "Way" Tapping Machines, C. V. Hunter. Am. Mach., vol. 52, no. 19, May 6, 1920, pp. 975-977, 6 figs. Multiple-spindle machine for tapping many holes simultaneously.

TAPS

Manufacture. See DRILLS, Manufacture of.

TAR

Characteristics. Characteristics of Primary Low-Temperature Tar, Franz Fischer. Chem. & Met. Eng., vol. 23, no. 2, July 14, 1920, p. 70. States that it must be liquid at room temperature; its specific gravity at 25 deg. cent. must correspond to 0.95-1.06; on thin layer it is a golden-red to port-wine colored oil; in fresh state it smells nearly always of sulphuretted hydrogen or sulphide of ammonium, and in no case should it smell of naphthalene. Translated from Zeitschrift für angewandte Chemie, 1920.

Continuous Plant. Hird's Continuous Tar Plant, S. Stonier. Gas Jl., vol. 148, no. 2943, Oct. 7, 1919, pp. 31-32. Development of continuous plant and comparison of it with intermittent of semi-intermittent pot-still.

Diesel-Engine Fuel. See DIESEL ENGINES, Tar Fuel.

Fractional Condensation. Fractional Condensation of Tar. Gas Age, vol. 45, no. 5, Mar. 10, 1920, pp. 220-222. Direct recovery of pitch and coal-tar oils from gas in German Tar Works. Translated from Journal für Gasbeleuchtung.

Producer-Plant Manufacture. Producer Plant for Production of Tar (Generatoranlage für Urteergewinnung), H. Gwosdz. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 12-13, Mar. 26, 1920, pp. 89-90, 1 fig. Describes plant equipped with apparatus built by Ehrhardt & Sehmer, with details of coking retort. Separation of tar is effected in a series arrangement of apparatus by washing and compression. The gas from dust separator is transmitted by means of a disintegrator in which the tar vapors are precipitated with aid of injected hot tar.

Recovery from Shale. Development of Coking Industry for the Recovery of Tar and Oil from Bituminous Shale and Lignite (Die Entwickelung der Schwerlindustrie zur Gewinnung von Teer und Oel aus bituminösen Schiefern u. Braunkohlen), R. Beyschlag. Zeitschrift für das Berg-Hütten und Salinenwesen, vol. 67, no. 3, 1919, pp. 185-256, 44 figs. Historical review of coke industry in Germany and other countries and modern experiments and investigations in Germany. Recovery of oil from shale; details of preliminary tests near Berlin, the experimental station in Schandelah near Braunschweig, and in Württenberg; recovery of tar from lignite; description of plants at Lützkendorf and Rositz; modern construction of large recovery plants.

Separation from Mineral Aggregates. The Extraction of Bitumens from Mineral Aggregate, M. R. Walczak and H. I. Rice. Jl. of Industrial and Eng. Chem., vol. 12, no. 8, Aug. 1920, pp. 738-740, 1 fig. Method proved sufficiently accurate, more rapid than many other methods, and tar bitumen is separated from its mineral aggregate in substantially its true state as existing in the mixture.

[See also WOOD, Tar Distillation.]

TAR EXTRACTORS

Wheel Type. Suggestions for Tar Extractor Improvement, George B. Cramp. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 543-545 and 576, 2 figs. Wheel type extractor of corrugated sheets for efficient cleaning, automatic control, instant adjustment of gas pressure and long operating period. Shutting down of extractor said to be avoided.

[See also GAS CLEANING, Tar Extractor.]

TAR OIL

Composition. The Chemical Composition of Sulphurous Bituminous Tar Oils, or Ichthyolic Oils (Ueber die chemischen Bestandteile der schwefelreichen, bituminösen Teeröle Ichthyolöle), Helmuth Scheibler. Berichte der deutschen chemischen Gesellschaft, vol. 52, no. 9, Oct. 15, 1919, pp. 1903-1910. Writer states it has been found advisable to subject crude oil to three successive purification methods which are here described. Tests are said to have resulted in the recovery of 225 grams of refined oil from 500 grams of crude oil from the South of France.

Properties. See FURNACES, BOILER, Tar-Oil-Fired.

TAXES

British System of Levying. A Simple Progressive Tax and Its Bearing on the Federal Income Tax and Other Acts, H. S. Carslaw. Jl. & Proc. Roy. Soc. New South Wales for 1918, vol. 52, pp. 203-214, 2 figs. Mathematical analysis of systems of levying taxes in Great Britain and various states in Australia.

TAXICABS

See AUTOMOBILES, Three-Wheeled Taxicabs.

TAYLOR SOCIETY

Standards. See STANDARDS, Taylor Society.

TAYLOR SYSTEM

Advantages. The Taylor System and Its Applications (Le système Taylor et quelques considerations sur son application), R. de Vallière. Bulletin Technique de la Suisse Romande, vol. 46, nos. 5 and 6, Mar. 6 and 20, 1920, pp. 49-53 and 61-63. It is shown how essence of system consists, not in requiring greater exertion of worker, but in regulating his normal exertion in a manner to increase production. Economical advantages of introducing Taylor system in manufacturing establishments are pointed out. It is visualized that principles upon which Taylor system is based could be profitably applied to financial enterprises and governmental departments as well.

Application of. Logical Steps in Installing the Taylor System of Management, H. K. Hathaway. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 89-96. Application and practice of Taylor system. First article of series.

Mnemonic Classification. The Mnemonic System of Classification, H. K. Hathaway. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 173-183, 13 figs. Method as used in Taylor system of management. Reason for and advantages of mnemonic classification in industry and examples showing how system is applied and used.

Rubber Industry. See RUBBER INDUSTRY, Taylor System in.

TELECOMPASS

See AERONAUTICAL INSTRUMENTS, Telecompass.

TELEGRAPH LINES

England. Underground and Submarine Telegraph Lines in England (Lignes télégraphiques souterraines et sous-marines en Angleterre), M. Ballet. Annales des Postes, Télégraphes et Téléphones, vol. 9, no. 1, March 1920, pp. 37-67, 23 figs. Operation is duplex differential or Wheatstone bridge. Types of installation generally used are quadruple duplex Baudot and double duplex Baudot. Schemes of connections are indicated and operation studied.

TELEGRAPHY

Alternating Current. Direct Utilization of Industrial Alternating Current at the Brest Telegraphic Bureau (L'utilisation directe des courants alternatifs industriels au bureau télégraphes des Brest). Annales des Postes, Télégraphes et Téléphones, vol. 8, no. 3, Sept. 1919, pp. 446-461, 7 figs. Mercury-vapor converter branches on three-phase alternating-current circuit feeds with direct current Morse, Hughes and Baudot telegraphic apparatus.

Automatic. Automatic Transmission in Telegraphy (La transmission automatique en télégraphie), J.-B. Pomey. Électricien, vol. 35, no. 1254, June 15, 1920, pp. 245-250, 5 figs. Survey of various types of apparatus for automatic transmission.

Baudot Multiplex. See Printing Systems.

Baudot Simplex and Quadruplex. The Baudot. Telegraph and Telephone Jl., vol. 5, nos. 56 and 57, Nov. and Dec. 1919, pp. 16-18 and 31-33, 10 figs.; vol. 6, nos. 58, 62 and 64, Jan., May and July 1920, pp. 48-49, 117 and 156-157, 7 figs. Double Baudot Simplex distributor plate. Electric weight lift attachment as applied at Indian Government Telegraph Works to both distributor and receiver. Toothing of wheels of weight-driven gearing with their corresponding pinions. Amplitude and speed. Baudot keyboard.

Duplexing Submarine Cables. The Semi-Bridge System of Duplexing Submarine Telegraph Cables (Kajiura's System), J. Kajiura. Telegraph & Telephone Age, vol. 38, no. 19, Oct. 1, 1920, pp. 510-512, 2 figs. Japanese invention said to have proven successful in application to a number of submarine telegraph cables.

Earth-Current. Earth-Current Telegraphy, L. C. Carus-Wilson. Bul. Int. Ry. Assn., vol. 2, no. 7, July 1920, pp. 422-431, 9 figs. Methods developed by armies for communication with troops at front. From Roy. Engrs. Jl.

High-Frequency. High Frequency Telegraphy and Telephony on Power Transmission Lines. (In Japanese.) Denki Gakkwai Zasshi, no. 376, Nov. 10, 1919. Symposium of papers presented before Tokio Section of Japanese Elec. Soc.

Line Interference. Effects of Heavy-Current Installations on Telegraph and Telephone Lines (Einwirkung von Starkstromanlagen auf Schwachstromleitungen), H. Brauns. Telegraphen- u. Fernsprech-Technik, vol. 8, no. 5, Aug. 1919, pp. 61-75, 7 figs. Survey of nature and extent of above-mentioned effect and measures for combating it.

Multiplex. High-Frequency Multiplex Telephony and Telegraphy (Hochfrequenz-Mehrfachtelephonie und-Telegraphie längs Leitungen), H. Fassbender and E. Habann. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 5, Oct. 1919, pp. 451-478, 17 figs. Discussion of development of a wire system completed before armistice and later enlarged upon to meet demands of German postal and railroad administrations. Both military and civil apparatus are described. The multiplex transmission of news is defined as a recent departure in feeble-current technique suggested by the introduction of vacuum tubes in wireless telegraphy.

The Siemens Rapid Telegraph Apparatus (Zur Einführung des Siemens-Schnelltelegraphen), George Schmidt. Dinglers polytechnisches Jl., vol. 335, no. 4, Feb. 21, 1920, pp. 41-43, 6 figs. Description of apparatus designed by Wilhelm v. Siemens which, similar to the Baudot system employs for every character five current impulses in positive and negative direction in certain given combinations, by which 32 combinations can be formed. Apparatus requires for each station three or four keyboard instruments for perforating the sending tapes, a sender and a receiver apparatus. See also Prometheus, vol. 31, no. 15, Jan. 10, 1920, pp. 113-116, 3 figs.

See also Printing Systems.

Morkrum Printing System. See Printing Systems.

Phantoplex. On the Phantoplex Telegraphy (in Japanese), Y. Fuseno. Denki Gakkwai Zasshi, no. 380, March 10, 1920. Paper read before Kwansai Section of Japanese Electrical Society.

Photographs, Transmission by. Electric Transmission of Photographs (Di un nuovo trasmettitore delle immagini fotografiche a distanza, con e senza filo), Umberto Bianchi. Elettricista, vol. 9, no. 5, March 1, 1920, pp. 33-36, 2 figs. System comprises ultra-sensitive selenium cell, audions possessing high amplifying power, and a special synchronizing system.

Pictures. See TELESTEREOGRAPHY.

Printing Systems. Analytical Theory of a Baudot Regulator (Teoria analitica del regola tore Baudot), Pasquale Pratola. Elettrotecnica, vol. 6, no. 34, Dec. 5, 1919, pp. 750-756, 6 figs. Equations expressing relations between electrical quantities during operation.

The Baudot. Telegraph & Telephone Jl., vol. 5, no. 55, Oct. 1919, pp. 1-3, 7 figs. Description of Baudot multiplex type printing telegraph system.

The Morkrum Printing Telegraph System. Telegraph & Telephone Age, vol. 37, nos. 21-

24, Nov. 1, 16, Dec. 1, 16, 1919, pp. 528-533, 557-564, 586-589 and 620-622, 32 figs.; vol. 38, nos. 1, 2 and 3, Jan. 1, 16 and Feb. 1, 1920, pp. 9-12, 32-35 and 69-72, 12 figs. Description of operation, automatic transmitter and printer.

Quadruplex, Improved. An Improved Quadruplex System. Telegraph and Telephone Age, vol. 38, no. 3, Feb. 1, 1920, pp. 65-66, 3 figs. Advantage is said to be gained by placing polar relay directly in main line and neutral or common relay in bridge circuit; also that operation of common side of quadruplex is improved by replacing standard neutral relay by single-line Morse relay of 240 ohms resistance and by inserting third relay in series with adjustable condenser.

Radio. See RADIOTELEGRAPHY.

Submarine-Cable. The Use of Alternating Currents for Submarine Cable Transmission, Frederick E. Pernot. Jl. Franklin Inst., vol. 190, no. 3, Sept. 1920, pp. 323-371, 14 figs. Results of experiments performed by members of Signal Corps Research Laboratory, Bureau of Standards, in attempt to develop method or methods of signal transmission over submarine cables which would permit of more effective use of existing cable systems. In method proposed and developed, signals are transmitted by means of alternating currents simultaneously with normal battery or direct-current operation of cable. Currents of several different frequencies may be used, reserving given frequency for each message, and by tuning or equivalent methods at receiving end these messages may be separated, so that simultaneous transmission of number of messages is rendered possible.

Wireless. See RADIOTELEGRAPHY.

TELEPHONE LINES

Aluminum vs. Copper. Aluminum Versus Copper Wires, Fred W. Scholz. Telephone Engr., vol. 22, no. 6, Dec. 1919, pp. 43-45, 4 figs. Experience is said to have proven that aluminum lines are entirely competent to replace copper conductors. Translated from Elektrotechnische Zeitschrift.

TELEPHONY

Aircraft. See Kite Balloons.

Anti-Induction of Lines. Anti-Induction of Telephonie Circuits (Anti-induction des circuits téléphoniques), M. Cahen. Annales des Postes, Télégraphes et Téléphones, vol. 8, no. 3, Sept. 1919, pp. 430-445, 8 figs. Comparative study of systems used in different countries.

Automatic. Applicability of Automatic Switching to All Classes of Telephone Service, Arthur Bessey Smith. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 12, Dec. 1919, pp. 1335-1368, 12 figs. Arguments are presented in support of contention that automatic switching of telephone lines is adaptable to all classes of telephone service and offers flexible means of solving problems.

Machine Switching, E. B. Craft. Telegraph & Telephone Age, vol. 38, no. 10, May 16, 1920, pp. 276-282, 14 figs. Apparatus for automatic telephony developed by Western Electric Co.

Some Comparisons of Automatic Exchange Systems. Post Office Elec. Engrs. Jl., vol. 12, part 4, Jan. 1920, pp. 193-202, 4 figs. Systems compared are A. T. M., Siemens' and Western.

Cross-Talk in Combined Circuits. Cross-Talk in Combined Telephone Circuits (Ueber das Nebensprechen in kombinierten Fernsprechkreisen), Leon Lichtenstein. Elektrotechnische Zeitschrift, vol. 41, nos. 10 and 11, Mar. 4 and 11, 1920, pp. 188-191 and 208-212, 15 figs. Account of experiment with a theory of cross-talk in combined telephone circuits, based on a system of four parallel lines. Simple formulæ are derived and discussed in detail.

Crystal Telephones. The Crystal Telephone, A. McL. Nicholson. Telephone Engr., vol. 22, no. 6, Dec. 1919, pp. 13-16, 13 figs. Exposition of piezoelectric effect in composite Rochelle-salt crystals and related optical and other properties belonging to these crystals.

Interference. European Telephone Practice, Fred. W. Scholz. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 38-40, 3 figs. Troubles caused to telephone service through interference of railway lines.

Kite Balloons. Aircraft Telephony, B. S. Cohen. Elecn., vol. 83, no. 2165, Nov. 14, 1919, pp. 548-549, 3 figs. Diagram of connections used on kite balloons.

Line Protection. Marius Latour System for the Protection of Telephonic Lines Against Perturbations Produced by High Tension Lines (Procédé pour la protection des lignes telephoniques contre les perturbations provoquées par le voisinage de lignes haute tension. Système Marius Latour), A. Costabel. Revue générale de l'Électricité, vol. 7, no. 1, Jan. 3, 1920, pp. 26-28, 5 figs. Principle of operation is: telephonic current is amplified at transmitting point and reduced at receiving point while at the same time intensity of perturbing current is lowered. Three-electrode valve is employed.

Lines, Calculation of. Calculation of Telephone Lines (Berechnung von Fernsprechleitungen), F. Lüschen. Telegraphen- u. Fernsprech-Technik, vol. 8, no. 6, Sept. 1919, pp. 81-93, 4 figs. Discusses wave resistance and propagation constants of homogeneous lines, and also their efficiency "distortion." Compound lines, or those consisting of two unequal homogeneous sections, are subsequently taken up.

Microphones. Multiple-Contact Microphone (Sur un microphone à alvéoles multiples), A. Soret and R. Conespel. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 9, Sept. 1, 1919, pp. 431-432. Microphone with 21-mm. carbon paste having 220 interstices each containing one granule of carbon is reported to have shown high sensibility and to have transmitted sound with extreme purity.

Progress in 1919. Progress in the Art of Communication, Bancroft Gherardi and Frank B. Jewett. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 202-204, 1 fig. Opinion is advanced that development of machine switching of telephone circuits and further applications of vacuum tubes marked year of 1919.

Receivers. See Recorders.

Recorders. Seelau and Newman Telegraphon (Das Telegraphon von Seelau und Newman), C. W. Kollatz. Elektrotechnischer Anzeiger, vol. 36, nos. 37 and 38, Apr. 24 and 27, pp. 177-178 and 181-182, 3 figs. Review of Gentilli, St. George, Palla and Poulson types and detailed description of telegraphon, an apparatus for automatically receiving and recording telephone messages.

Relay Automatic System. The Relay Automatic Telephone System, A. B. Eason. Post Office Elec. Engrs. Jl., vol. 13, part 1, April 1920, pp. 13-21, 6 figs. Description of operation.

Relays. Gas Discharge Telephone Relays and Their Application to Commercial Circuits, C. Robinson. Instn. Post Office Elec. Engrs., no. 76, pp. 3-52 and (discussion) pp. 53-60. Description of gas discharge relays and principles involved and outline of their application to commercial use.

Repeaters. Technical Development of Telephonic Repeaters Since 1917, R. M. Chamney. Instn.

Post Office Elec. Engrs., no. 76, pp. 62-113 and (discussion) pp. 114-128, 36 figs. Results of tests of typical hard valve are included. It is claimed that double-relay type repeater has greater range of application than single-relay type because double-relay repeaters are suitable for use on circuits in which more than one repeater is used and also in cord circuit which may be plugged into various types of line.

Telephone Repeaters, Bancroft Gherardi and Frank B. Jewett. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1255-1313, 48 figs., partly on 8 supp. plates. Also in Elecn., vol. 84, no. 2192, May 21, 1920, pp. 571-573, 6 figs. History of research and development work which has led up to final production of successful telephone repeaters. Various forms of amplifiers are described and their possibilities and limitations pointed out.

Secret. A Secret Common Battery Intercommunication Telephone System. Engr., vol. 129, no. 3361, May 28, 1920, pp. 550-551, 9 figs. Discusses possibilities, limitations, and scope for improvement in system, with particular reference to a new secret system invented by H. G. Shrivell.

Amplifiers for a Secret Telephone (Un téléphone secret par amplificateurs), P. Maurer. Électricien, vol. 35, no. 1252, May 15, 1920, pp. 199-201, 3 figs. System used by French Army during war.

The Secret Telephone, F. Honore. Sci. Am., vol. 121, no. 23, Dec. 6, 1919, pp. 555, 3 figs. Rotating commutator deforms current at sending apparatus and reforming mechanism restores current to original character at receiving element.

Switchboard Cables. Heating of Switchboard Cables. Post Office Elec. Engrs. Jl., vol. 13, no. 2, July 1920, pp. 116-122, 5 figs. Results of tests made upon telephone switchboard cable of 23 S. W. G. wires, to prove that no excessive heating could occur with the use of these wires in certain telephone circuits. Tests also gave information upon heat conductivities of insulating materials.

Switching. Some Telephone Switching Problems, G. H. B. Bernard. Trans. S. A. Inst. of Elec. Engrs., vol. 11, no. 5, May 1920, pp. 76-97, 9 figs., 4 on supp. plate. Object of paper is to analyze and explain in elementary manner problems involved in inter-connecting various subscribers in a single telephone area, both manually and automatically.

Wireless. See RADIOTELEPHONY.

[See also PHOTOTELEPHONY; RADIOTELEPHONY; TELEGRAPHY, Multiplex.]

TELEPHOTOGRAPHY

Transatlantic. Transatlantic Telephotography (La tele-fotografia transatlantica), Alfred Gradenwitz. L'Elettricista, vol. 8, no. 21, Nov. 1, 1919, pp. 167-168, 4 figs. Stereotype transmitted by causing rays of light from Nernst lamp to pass through stereotype and act on selenium cell.

TELESCOPES

Automatic Coupling for Mechanism of. Improved Automatic Coupling for Motor Driven Telescope Mechanism (Verbesserte automatische Kuppling für Fernrohr-Triebwerke mit direktem elektromotorischen Antrich), J. Rheden. Zeitschrift für Instrumentenkunde, vol. 39, no. 9, Sept. 1919, pp. 273-280, 4 figs. Coupling described is provided with means for automatically regulating pressure, which, it is said, can be used with almost any type of regulator.

TELESTEREOGRAPHY

Electrical Transmission of Pictures. The Electrical Transmission of Pictures, Philip R. Coursey. Nature (Lond.), vol. 106, no. 2656, Sept. 23, 1920, pp. 115-116, 1 fig. Modification of Baine's early chemical telegraph.

TELLURIUM

See FLAME REACTIONS, Selenium and Tellurium; SELENIUM, Uses.

TELPHERS

Automatic Electric. Blocking and Controlling Devices for Automatic Electric Telphers, Norman G. Kapp. Eng. and Indus. Management, vol. 4, no. 11, Sept. 9, 1920, pp. 342-345, 10 figs. German types.

[See also COAL HANDLING, Telpher System; CONVEYORS, Electric.]

TEMPERATURE

Absolute-Temperature Scale. On the Establishing of the Absolute Temperature Scale, Frederick G. Keyes. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 54-59. Application of atmospheric nitrogen to problem of establishing absolute-temperature scale.

TEMPERATURE CONTROL

Apparatus. Use of Superheated-Steam Temperature Regulators (Die Verwendung von Heisdampf-Temperatur-Reglern). Kali, vol. 13, no. 16, Aug. 15, 1919, pp. 261-263. It is said that temperature can be regulated only by special measures, namely, by releasing superheater from gas current, by mixing superheated steam with saturated steam or with water, and by discharging superfluous superheat in boiler water.

Automatic. Automatic Control of High Temperatures. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1516-1517, 2 figs. Automatic recording controller manufactured by Leeds & Northrup Co., Philadelphia.

Systems. Temperature Indicating, Recording and Controlling Systems. Machy. (Lond.), vol. 15, nos. 372 and 375, Nov. 13 and Dec. 4, 1919, pp. 199-206 and 291-300, 36 figs. Nov. 13: Types of apparatus for indicating temperature. Recording and controlling temperatures in heat-treating furnaces. Dec. 4: Further examples of recording and controlling furnace temperatures; automatic furnace temperature regulation.

TEMPERATURE MEASUREMENT

Electric Indicator. Designing an Electric Temperature Indicator, V. H. Todd. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1018-1019, 4 figs. Principle of operation and method of making required calculations.

Liquid Steel. Steel Furnace Temperature Measurements, George K. Burgess. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 550-551. Role played by research laboratory in problem of measuring liquid steel temperatures. Work of Bur. of Standards and National Research Council. Paper read before Am. Iron & Steel Inst.

TENSIMETER

See LIQUIDS, Surface Tension, Measurement of.

TERMINALS, FREIGHT

See MOTOR-TRUCK TRANSPORTATION, Cincinnati Freight Terminals; TERMINALS, RAILWAY, Freight.

TERMINALS, LOCOMOTIVE

Ashmore, L. V. R. R. Ashmore Engine Terminal, Lehigh Valley R. R. Ry. Rev., vol. 66, no. 23, June 5, 1920, pp. 904-909, 14 figs. De-

scription of locomotive terminal and repair plant, the engineering for and construction of which has been done entirely by owning road. Features of work are said to be concrete construction involved in roundhouse and in cinder pits, which are of flooded type and have been devised with view to cutting down of delays and operating costs at this point to a minimum.

Lehigh Valley R. R. New Engine Terminal for Lehigh Valley Railroad. Eng. News-Rec., vol. 84, no. 11, Mar. 11, 1920, pp. 514-516, 7 figs. Details of engine house, coaling station and ashpit.

Michigan Central R. R. West Division Engine Terminal, M. C. R. R. Ry. Rev., vol. 66, no. 18, May 1, 1920, pp. 709-717, 22 figs. Terminal consists of 30-stall roundhouse and 6-stall erecting shop with adjacent machine, forge and flue shops, which are all maintained as a unit. Power is supplied from central powerhouse.

Rectangular. A Terminal Built for Special Operating Conditions. Ry. Age, vol. 68, no. 13, Mar. 26, 1920, pp. 1025-1030, 10 figs. Special design of yards necessitated in order to serve coal traffic movement westward from Utah coal field. Among distinctive features is rectangular engine terminal, innovation undertaken because of considerable number of Mallet engines which must be accommodated at that terminal and difficulty encountered in keeping turntable pit clear for operation.

TERMINALS, MARINE

Barge Canal, New York. Largest Barge Canal Terminal Opened in New York City, Frank M. Williams. Eng. News-Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1047-1051, 4 figs. Old timber pile pier remodeled and provided with modern freight shed and extensive freight-handling machinery both outside and in.

Cargo Handling. Bulk Cargo Handling on the Atlantic Coast. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 740-743, 3 figs. Wellman-Seaver-Morgan unloader. Leg is so mounted in walking beam that it can rotate in circle, allowing bucket to reach out in all directions. Machine can unload 97 per cent of cargo without help of shovelers.

Development of Mechanical Cargo Handling at Marine Terminals, James A. Shepard. Freight Handling and Terminal Eng., vol. 5, no. 11, Nov. 1919, pp. 420-424. Because of similarity between general conditions of handling material in manufacturing plant and in marine and railway terminals, it is concluded that basic principles on which successful solution of the one problem rests offer greatest promise of solution of the other. Paper read before Soc. Terminal Engrs.

Charleston, S. C. The Charleston Port Terminal, Hurley Abbott. Freight Handling and Terminal Eng., vol. 5, no. 12, Dec. 1919, pp. 452-458, 4 figs. Terminal is laid out in three parts: (1) remount station and animal embarkation depot, (2) quartermaster depot for storage and shipment of all quartermaster materials, and (3) ordnance depot for storage and shipment of ammunition, powder and TNT.

Dimensions for. Quay Design for Ocean, Lake, Inland River and Canal Terminal, H. McL. Harding. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 182-187, 7 figs. Generalization and codification of dimensions generally adopted in quay terminals.

Economical Construction and Equipment. Quays More Economical Than Piers for Comprehensive Port, F. T. Chambers. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 556-558, 3 figs. Urges economical construction and equipment of marine terminals and their coordinate economic management.

Fire Protection. Special Hazards at Terminal Centres, F. W. Cowie. Contract Rec., vol. 34, no. 39, Sept. 29, 1920, pp. 931-932. Because concentration of highly inflammable materials makes ocean port especially susceptible to serious fire losses, writer believes that fireproof construction should be insisted upon.

Freight-Handling Machinery. Port Facilities, Charles Evan Fowler. Pac. Mar. Rev., vol. 17, no. 9, Sept. 1920, pp. 91-94, 5 figs. Various types for use on docks and piers. Paper read before Great Lakes and St. Lawrence Water Way Congress.

Fundamental Elements. Fundamental Elements of a Modern Port Terminal, J. C. McVea. Freight Handling & Terminal Eng., vol. 6, no. 1, Jan. 1920, pp. 28-32. Essential requirements enumerated are: (1) Waterway of ample depth and width to accommodate all water craft; (2) commodius and well-equipped wharves, docks or piers and storage warehouses; (3) marginal highway back of wharves providing free motion for all vehicles of land traffic; and (4) industrial district for conversion of raw materials of both home and foreign productions into finished articles of commerce.

Inefficiency, Cost of. The Cost of Inefficiency at Our Terminals, Harwood Frost. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 768-769. Writer estimates an annual waste of not less than $400,000,000 at American terminals due to inefficient equipment and methods. He indicates way in which it can be eliminated.

Mechanical Handling in. Mechanical Handling in Marine Terminal Work, Harwood Frost. Freight Handling & Terminal Eng., vol. 6, no. 2, Feb. 1920, pp. 48-56. Writer divides devices available for handling freight into three general classes—portable, stationary, and so-called "semi-portable," and points out value of portable conveyor, its adaptability and capacity. Writer also points out objections to mechanical equipment. Paper read before Soc. Terminal Engrs.

Milwaukee. Proposed Water Terminal Development for Milwaukee. Eng. World, vol. 17, no. 2, Aug. 1920, pp. 109-111. It is proposed to put harbor and dock facilities outside river, retaining river for barge deliveries and pick-ups.

Philadelphia Army Base. Planning and Progress on a Big Construction Job, Charles Penrose. Eng. News-Rec., vol. 84, no. 12, Mar. 18, 1920, pp. 554-561, 7 figs. How records were kept at Philadelphia army base in order to plan and schedule work, to follow progress of construction, and to control future operations.

Piers. Pier Design for Ocean and Lake Terminals, H. McL. Harding. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 102-104, 2 figs. Opinion is expressed that single unit piers about 700 ft. long should be 140 to 150 ft. wide with slips 280 to 300 ft. wide, and that sheds should be equipped with overhead tiering machinery to give large capacity for storage.

Portland, Ore. Municipal Grain and Freight Port at Portland, Ore., W. P. Hardesty. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 179-182, 4 figs. Terminal consists of piers with ship slips, reinforced-concrete elevator embracing track-shed, operating house and storage annex, tanks for oil storage and open area for industrial and manufacturing concerns that may be established in the future.

San Francisco. Pacific Port Terminal, B. F. Cresson, Jr. and C. W. Staniford. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 98-101, 3 figs.

Project for increasing shipping facilities of San Francisco.

Tractors and Trailers in. Trucks, Tractors and Trailers in Marine Handling, H. C. Yost. Freight Handling & Terminal Eng., vol. 6, no. 4, April 1920, pp. 146-150, 5 figs. Various types are illustrated and estimates of cost of operating them are made.

Transfer Costs. Terminals—Transfer Costs—Coast, Roy S. MacElwee. Freight Handling & Terminal Eng., vol. 6, no. 7, July 1920, pp. 256-265. Economical advantage derived from sending goods directly from lake ports to Europe. Paper read before Great Lakes-Tidewater Congress.

[See also ARMY SUPPLY BASES; RAILWAYS, Marine Terminal.]

TERMINALS, RAILWAY

A. E. F., France. Terminals Built on the Orléans Railway by the Americans During the War (Gares Américaines établies pendant la Guerre sur le réseau d'Orléans), M. Epinay. Revue générale des Chemins de Fer, vol. 39, no. 5, May 1920, pp. 329-346, 15 figs. Details of terminals noting specially differences between American and French design practices.

Chicago. Chicago Terminal Situation, E. J. Noonan. Jl. Western Soc. Engrs., vol. 24, no. 5, May 1919, pp. 282-299 and (discussion) pp. 299-306, 4 figs. Solution of passenger station problem is proposed, which is based on assumption that eventually through passenger stations recommended will be used exclusively for accommodation of through passenger trains, and that other terminal facilities will be provided for suburban trains.

Compressed-Air Service. See COMPRESSED AIR, Railway Terminals.

Design. Terminal Facilities, F. F. Gaines. Ry. Rev., vol. 67, no. 15, Oct. 9, 1920, pp. 546-548. Economics of location, design of shop structures, arrangement and equipment of departments, heating, lighting, ventilation and employees' convenience.

Electrical Equipment. See Kansas City.

Freight. Municipal Freight Terminals, O. W. Stiles. Ry. Rev., vol. 67, no. 7, Aug. 14, 1920, pp. 233-235. Suggestion is offered as means of making present rolling stock adequate to needs of present-day transportation requirements, that each municipality assume financial and operating responsibility for its own terminals, leaving roads with more definite transportation duty and less of business duty to perform.

Freight Handling. Acceleration of Freight Handling at Terminals, H. McL. Harding. Ry. Rev., vol. 66, no. 20, May 15, 1920, pp. 792-795. Urges installation of standard mechanical appliances at railway terminals. Paper read before Soc. of Terminal Engrs.

Grand Central, New York City. Grand Central Development Seen as Great Civic Center. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 496-504, 12 figs. Unit includes depot, post office, hotels, office buildings, apartments, clubs and stores.

Indianapolis. Trainshed Roof of Steel Arches Instead of Columns. Eng. News-Rec., vol. 85, no. 8, Aug. 19, 1920, pp. 350-352, 5 figs. Design of new union station.

Kansas City. Electrical Equipment of Kansas City Terminal, Roy W. Budd. Elec. Rev. (Chicago), vol. 76, no. 23, June 5, 1920, pp. 933-936, 6 figs. Account of general features of power-plant equipment, lighting installation, motor-driven equipment, telephones and telautographs, and electric trucks and tractors.

"High Line" Construction for the Kansas City Passenger Terminal. Ry. Rev., vol. 67, no. 8, Aug. 21, 1920, pp. 263-269, 21 figs. Line consists of 3900 ft. of surface tracks, 8800 ft. of approach embankment, 8500 linear ft. of steel viaduct and double-deck bridge across Kansas river.

Motor Trucks. See MOTOR TRUCKS, Use at Railway Terminals.

New York District. Operation of Railroad Terminals, New York Terminals District, J. J. Mantell. N. E. R.R. Club, Dec. 9, 1919, pp. 212-222 and (discussion) pp. 223-230. It is concluded from examination of conditions in New York that "if New York is to retain its supremacy as the foremost port, serious and immediate consideration must be given to its proper economic development, considering the port as a whole and not only that part which is under the jurisdiction of the City of New York and State of New York, but, as well, the section on the Jersey shore."

Relation to City Plan. Relation of Railroad Terminals to City Plan. Ry. Age, vol. 68, no. 18, April 30, 1920, pp. 1285-1288, 2 figs. Report presented to Railroad Committee of Twelfth National Conference on City Planning. Sketch is presented suggesting connection between terminals comparatively remote.

Southern Pacific, San Francisco. New Industrial Development Planned at San Francisco. Eng. News-Rec., vol. 84, no. 7, Feb. 12, 1920, pp. 319-320, 2 figs. Design adopted by Southern Pacific for rail and deep-water terminal.

Union Pacific Railway. The Union Pacific Overhauls Its Engine Terminals. Ry. Age, vol. 69, no. 14, Oct. 1, 1920, pp. 557-561, 9 figs. Details of plans involving building of six new roundhouses and enlarging of others and increasing of shop facilities.

Zurich, Switzerland. Enlargement of Main Railroad Terminal at Zurich (Die Erweiterung des Hauptbahnhofs Zürich). Schweizerische Bauzeitung, vol. 74, no. 24, Dec. 13, 1919, pp. 289-293, 8 figs. Details of platform arrangement and necessary alterations of surrounding streets and squares.

TERRA COTTA

Grog Grain, Effect of Size. The Effect of the Size of Grog Grain in a Terra Cotta Body, H. E. Davis. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 641-652, 7 figs. It is concluded from results obtained experimentally that to develop good strength, both burned and dry, grog ingredient should contain rather large amounts of fine material as coarser material cracks and thus weakens body.

The Effect of Variation on the Size of the Grog in Terra Cotta Bodies, R. L. Clare and D. F. Albery. Jl. Am. Ceramic Soc., vol. 3, no. 5, May 1920, pp. 384-387. Experimental results showed rather clearly that, if a terra cotta body is to be kept uniform as to its physical properties, the grog size must be controlled. It is suggested that most suitable material could be selected for grog, it could be burned to proper hardness and ground so as to give best results in the body, and this could be prepared at some central plant, extra cost of grog prepared in this manner would be, in author's belief, more than offset by advantages obtained.

TESTING MACHINES

Bending Tests. Dynamic Tests of Metals by the Vibroflectometer (Essais dynamiques des métaux par le vibroflectométre), H. Lepape. Technique Automobile et Aérienne, vol. 2, no. 109, second quarter 1920, pp. 43-45, 4 figs. Patented machine for quantity testing.

Brinell Hardness. See Hardness.

Düsseldorf Types. Modern Testing Machines (Neuere Prüfmaschinen), E. Irion. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 26, June 26, 1920, pp. 477-482, 20 figs. Points out importance of testing machines at present time due to high prices of raw materials, and describes recent developments of machines for tensile-strength tests of the Düsseldorf Machine Construction Corp., with notes on drives employed, dynamometers, gripping devices and apparatus for measuring distortion.

Dynameter. Graphical Measurements of Periodic Dynamic Action by Means of "Dynameter" (Les measures graphiques des actions dynamiques periodiques au moyen du "dynamètre"). Génie Civil, vol. 76, no. 6, Feb. 7, 1920, pp. 154-157, 7 figs. Apparatus for measuring rapid and irregularly variable dynamic actions, particularly shocks experienced by railway car while wheels are passing over rail joint. Records of measurements taken with Schlüssel dynameter are discussed.

Extensometer. A New Extensometer, T. E. Hurst. Metal Industry (Lond.), vol. 16, no. 7, Feb. 13, 1920, pp. 130-131, 1 fig. Hurst-Tomlinson adapted for use in commercial testing of properties of metals used in engineering construction. It measures both extension and corresponding load.

Foundry. Testing Machines as Related to the Foundry, Thorsten Y. Olsen. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 525-530, 13 figs. Survey of recent types, notably standard level type Brinell hardness-testing machines, hydraulic type Brinell hardness-testing type, automatic and autographic torsion machine, universal efficiency testing machine, Matsumura repeat-impact testing machine, and Norris slip-abrasion testing machine.

Gears. See GEARS, Spur-Gear Testing Machine.

Hardness. A New Hardness Testing Machine. Ry. & Locomotive Eng., vol. 33, no. 8, Aug. 1920, p. 251, 1 fig. Portable Brinell testing machine for quantity work.

Brinell Machine for High-Temperature Testing. Eng., vol. 109, no. 2822, Jan. 30, 1920, p. 157, 3 figs. Specimens of steel wire tested at different temperatures up to 850 deg. cent. Hardness curves constructed show that the greater the cutting efficiency the higher is the Brinell hardness at elevated temperatures.

New Hardness Testing Machine has Wider Range of Action. Automotive Manufacturer, vol. 62, no. 5, Aug. 1920, pp. 20-21, 4 figs. Rockwell machine. Test is made by forcing alloy steel point under constant pressure into work under test.

Note on "The Ball Test," Thomas Baker. Iron & Steel Inst., Paper 2, Annual Meeting, May 6 and 7, 1920, 16 pp., 9 figs. Experiments conducted to ascertain significance of constants a and n, b and m in relations $L=bV^m$ and $L=adn$, and to correlate variations in them with changes in other physical properties of material under investigation.

Hydraulic. 50-Ton Hydraulic Metal-Testing Plant. Engineering, vol. 108, no. 2814, Dec. 5, 1919, pp. 752 and 754, 2 figs. Arrangement consists of vertical hydraulic testing machine, together with electrically-driven pump and accumulator.

Impact. New Testing Machines. Iron & Coal Trades Rev., vol. 100, no. 2720, April 16, 1920, p. 526, 4 figs. Description of Eden-Foster repeated impact testing machine and Humfrey autographic notched-bar testing machine.

Notched-Bar Test Pieces. Report on British Standard Forms of Notched Bar Test Pieces. British Eng. Standards Assn., no. 131, 1920, 15 pp., 17 figs. Standards approved on July 15, 1920.

Paper Strength. New Tearing Machine Measures Strength of Paper. Paper, vol. 26, no. 26, Sept. 1, 1920, p. 11, 1 fig. Recent development by Forest Products Laboratory makes duplicate tears in several sheets at once. Operations by means of a pendulum.

Repeated-Stress. A New Repeated-Stress Testing Machine, Jesse B. Dommers. Wisconsin Engr., vol. 24, no. 8, May 1920, pp. 297-299, 1 fig. Machine designed and used by writer at research laboratory of University of Illinois.

Eden Foster Testing Machine for Repeated Stresses (La machine à essayer aux chocs répétés Eden Foster). Technique Automobile et Aérienne, vol. 10, no. 110, 1920, pp. 65-67, 5 figs. Machine is designed to operate without being fastened on solid foundation. Records of its operation are given, both when attached to foundation and when resting on ground.

Springs. See SPRINGS, Testing Machine.

TETRALIN

See RUBBER, Solvents.

TETRAPHOSPHATE

See FERTILIZERS, Tetraphosphate.

TETRYL

See EXPLOSIVES, Tetryl.

TEXTILE INDUSTRY

Machinery. The British and Foreign Textile Machinery Industry. Eng., vol. 110, no. 2850, Aug. 13, 1920, p. 209. Tables of exports of textile machinery from Great Britain from 1913 to 1920.

Research. Developments and Tendencies in Research Work. Textile World Jl., vol. 57, no. 6, Feb. 7, 1920, pp. 209-214, 3 figs. Influence exerted upon textile industry by demonstration in war work of possibilities and advantages of systematic research.

Research in the Textile Industry, E. D. Walen. Textile World Jl., vol. 56, no. 16, Nov. 22, 1919, pp. 253-255. Possibility of application of research to raw material, yarns and fabrics. Address at World Cotton Conference.

Safety Education in. Safety Education in Textile Industry, William S. Ide. Textile World Jl., vol. 56, no. 15, Nov. 15, 1919, pp. 91-92. Records of accomplishments at mills of one company.

Thread Standardization. Metric Standardization of Textile Threads (Titrage et numérotage métrique des fils de toute nature), James Dantzer. Technique Moderne, vol. 12, no. 6, June 1920, pp. 269-273. Urges international standardization to eliminate confusion.

TEXTILE MILLS

Cleaning in. See COMPRESSED AIR, Textile Uses.

Compressed Air in. See COMPRESSED AIR, Textile Uses.

Drawing Rolls, Setting. The Setting of Drawing Rolls. Textile World Jl., vol. 57, no. 3, Jan. 17, 1920, pp. 45-46, 6 figs. Writer asserts that improper setting or neglect of any kind of setting of drawing rolls on roving and spinning frames in cotton mills is responsible for considerable amount of deficient work and waste.

Electric Drive in. Electrical Operation of a Small Textile Mill, H. C. N. Ripley. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1 and 8, 1919, pp. 868-869, 4 figs. Details of motor installations, motor-control equipment and lighting layout, together with cost of lighting and power service.

Electric Power Supply. Electric Power Supply

of Southern Textile Mills. J. E. Sirrine. Mech. Eng., vol. 42, no. 3, Mar. 1920, pp. 161-163 and 205, 7 figs. Typical examples of generating plants, distribution lines, substations and motor installations are illustrated.

Hot-Water Supply. Hot Water Supply of Textile Mills, W. C. Beekley. Textile World Jl., vol. 57, no. 2, Jan. 10, 1920, pp. 103-105. Need of careful analytical study of conditions in every plant is pointed out.

Safety in. Plant, Machinery and Layout Affecting Accidents in Textile Mills, Kenneth Moller. Safety Eng., vol. 38, no. 4, Oct. 1919, pp. 220-221. Principal elements for safety in cotton mills said to be proper lighting, proper alleys, proper spare floor for trucks, proper heating and ventilating, proper dressing and rest rooms and proper upkeep and use of all these after they are installed.

Steam Use in. Steam Use in Textile Processes, George H. Perkins. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 14-16, 2 figs. Tables of comparative figures showing importance of use of steam for manufacturing processes in textile industry. Analyses are given of various uses to which steam is put, and suggestions are made for research and improvement of economy.

TEXTILES

Manufacturing, Principles of. Principles of Manufacturing Textile Goods from an Engineering Point of View, W. Myers and W. A. Hanton. Elecn., vol. 84, no. 2181, Mar. 5, 1920, pp. 244-249, 5 figs. Review of various processes involved.

Spinning and Dyeing. See YARN, Spinning and Dyeing.

Testing Under Ultra-Violet Rays. Testing Textile Materials Under Ultra-Violet Light (L'emploi des rayons ultra-violets pour constater la désagrégation des tissus sous l'influence de la lumière), Martial Entat. Bulletin de la Société d'Encouragement pour l'Industrie nationale, vol. 132, no. 2, Mar.-Apr. 1920, pp. 166-182, 15 figs. It was determined that exposure to mercury-arc lamp for two or three hours was equivalent to exposure to sun for 30 days. It is therefore concluded that mercury-arc lamp can be used for testing fabrics for sun exposure.

THALLIUM

Amalgams. Concentrated Thallium Amalgams: Their electrochemical and thermochemical Behavior, Densities and Freezing Points, Theodore W. Richards and Farrington Daniels. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1732-1768, 12 figs. Experimental measurements of electromotive forces between amalgams ranging from 0.33 per cent to saturation (over 40 per cent). These potentials were found to be greater than those demanded by simple concentration law.

Tin-Thallium Alloys. See TIN ALLOYS, Tin-Thallium.

THALOFIDE CELL

See PHOTOELECTRICITY.

THEATERS

Construction. A Community Amusement Building, Donald J. Baker. Coal Age, vol. 16, no. 15, Oct. 9, 1919, pp. 602-604, 2 figs. Built at Pennsylvania Mine. Building is of stucco-tile construction with fiber roofing.

Some Features of Danforth Theatre, Toronto. Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1037-1038, 3 figs. Notably concrete balcony and pre-cast roof.

Lighting. See LIGHTING, Theaters.

Proscenium Girder. See GIRDERS, Reinforced-Concrete.

Roof Trusses. See CONCRETE CONSTRUCTION, REINFORCED, Roof Trusses.

THEODOLITES

German. The Accuracy of Vernier Repeating Theodolites with 12-cm. Base Circle (Ueber die Genauigkeit von Nonientheodoliten mit 12 cm. Durchmesser des Grundkreises aus Reihenerzeugung), K. Lüdemann. Zeitschrift für Instrumentenkunde, vol. 40, no. 3, Mar. 1920, pp. 49-56, 1 fig. Describes instruments made by Max Hildebrand, Freiberg, used by engineer troops during war.

THERMAL ANALYSIS

Simplified Method. A Simplification of the Inverse-Rate Method for Thermal Analysis, P. D. Merica. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 336, June 11, 1919, pp. 101-104, 1 fig. Suggested method of recording successive time intervals without use of chronograph.

THERMIONIC VALVES

Alternating-Current Generation. The Three-Electrode Thermionic Valve as Alternating Current Generator, C. L. Fortescue. Engineering, vol. 108, nos. 2806 and 2807, Oct. 10 and 17, 1919, pp. 491-493, 525-527, 18 figs. Also in Radio Rev., vol. 1, nos. 2 and 3, Nov. and Dec. 1919, pp. 83-88 and 134-143, 15 figs. Work done during war in Wireless Telegraph Dept. of Portsmouth Signal School. Theory of combination of valve and capacity-inductance circuit. Paper read before Eng. Section, British Assn. for Advancement of Science.

Thermionic Vacuum Tube as Detector, Amplifier and Generator of Electrical Oscillations, W. H. Eccles. Elecn., vol. 84, no. 2190, May 7, 1920, pp. 522-524, 8 figs. Notes on space charge; addition of a third electrode, or grid; cascade amplifier; application of triode tubes, application of beat principle, cumulative rectification, etc. Abstract of two lectures delivered before Royal Inst.

Amplifiers. See Alternating-Current Generation.

Amplification, Measurement of. On the Measurement of Amplification given by Triode Amplifiers at Audible and at Radio Frequencies, F. E. Smith and H. C. Napier. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 116-132, 7 figs. Mutual inductance method in which alternating voltage applied between filament and grid of first valve is varied by quickly changing connections to air-core transformer having two secondaries at right angles, these secondaries to be capable of rotation so as to give any desired ratio of mutual inductances between primary and respective secondaries.

Detectors. See Alternating-Current Generation.

Low-Power Lamp. A New Low-Power Lamp Rectifier of Alternating Current, John Scott-Taggart. Elecn., vol. 84, no. 2188, Apr. 23, 1920, p. 451, 1 fig. Lamp operates on principle of Edison effect. A flat nickel plate is placed between the two legs of a horseshoe filament of spiralized tungsten wire. External connections are taken from middle point of filament and from plate.

Oscillations of. On the Variations of Wave-Length of the Oscillations Generated by Three-Electrode Thermionic Tubes due to Changes in Filament Current, Plate Voltage, Grid Voltage, or Coupling, W. H. Eccles, and J. H. Vincent. Proc. Roy. Sec., vol. 96, no. A680, Feb. 3, 1920, pp. 455-465, 7 figs. Experimental investigation conducted to study effects of altering each of chief variables with view to finding

conditions most favorable for production of continuous waves of constant frequency.

The Thermionic Valve and Its Developments in Radiotelegraphy and Telephony, J. A. Fleming. Wireless Press, Ltd., 279 pp., 144 figs. Account of discovery of "Edison effect," its application to Fleming oscillation valve, subsequent development of three-electrode valve, and of investigations concerning oscillation-producing power of thermionic valve.

Physics of. Notes on the Physics of the Thermionic Valve, T. G. Petersen. Wireless World, vol. 7, no. 82, Jan. 1920, pp. 566-572, 10 figs. Summary of kinetic theories in relation to gases, liquids and solids, is presented with a view to clarifying conception of emission of electricity from hot metals in vacuo.

Testing. A Comparative Method of Testing Thermionic Valves for Passing no Reverse Current at High Voltages, N. W. McLachlan. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 72-77, 4 figs. Anode of standard valve known to pass no reverse current is connected to that of valve under test and filaments are joined to terminals of high-tension alternating-voltage supply. Low-reading electrostatic voltmeter with parallel condenser is arranged to indicate if valve under examination passes reverse current.

Tungsten Filaments for. The Short Tungsten Filament as a Source of Light and Electrons, G. Stead. Jl. Inst. Elec. Engrs., vol. 58, no. 287, Jan. 1920, pp. 107-117, 8 figs. Experiments at Cavendish Laboratory undertaken during the early part of 1918 in order to provide data for design of tungsten filaments for thermionic valves for use in Royal Navy, England.

Use in Radiotelegraphy. The Thermionic Valve in Wireless Telegraphy and Telephony, J. A. Fleming. Nature (Lond.), vol. 105, no. 2649, Aug. 5, 1920, pp. 716-720, 3 figs. Historical survey.

The Three-Electrode Lamp-valve (La Lampe-valve à trois Electrodes), G. Gutton. Société Belge des Électriciens, vol. 33, July-Sept. 1919, pp. 202-208, 16 figs. Résumé of work done by branch of military radio-telegraphy of French Army, particularly in relation to establishing communication between airplane and the earth. From Revue générale de l'Électricité.

Wireless in the R. A. F. during the War, T. Vincent Smith. Aeronautics, vol. 17, no. 312, Oct. 9, 1919, pp. 348-350. Particularly introduction of thermionic valve. Paper read before British Assn. for the Advancement of Science.

[See also RADIOTELEGRAPHY, Amplifiers; VACUUM TUBES, Oscillators.]

THERMIT WELDING

Locomotive Repairs. Repairs Made with Thermit. Ry. Jl., vol. 25, no. 8, Aug. 1919, pp. 21-23, 6 figs. Welds made on locomotive parts in railway shops.

Railway Repair Shops. Where Thermit Means Economy. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 14-16, 10 figs. Examples of welding by thermit process at repair shops of various railways.

Welder Tie Rods, Tests of. Strength of Thermit Welded Tie Rods. Welding Engr., vol. 5, no. 2, Feb. 1920, p. 40. Tests of original bars and same bars thermit welded gave 48,560 lb. per sq. in. value for tensive strength for original bar and from 27,000 to 52,000 lb. per sq. in. for welded bars.

THERMOCOUPLES

Common Metals. The Usefulness of Thermocouples of Common Metals for High-Temperature Work (Ueber die Brauchbarkeit von Thermoelementen aus unedlen Leitern in hohen Temperaturen), Fr. Hoffman and A. Schulze. Electrotechnische Zeitschrift, vol. 41, no. 22, June 3, 1920, pp. 427-433, 4 figs. A number of thermocouples, even at temperatures of 1000 to 1200 deg. and after a 100 hr. or longer period of heating gave results correct within about 10 per cent; the different nickel-chromium alloys, the carbon tube and the 66 per cent nickel steel especially gave evidence of great resistivity. The results obtained are so tabulated that they can be applied to determination of similar elements.

Electrically Deposited. Electrically Deposited Thermo-Couples. Engr., vol. 130, no. 3373, Aug. 20, 1920, p. 143, 7 figs. Number of turns of constantan wire were wound upon ebonite rod and immersed in copper plating bath so that half circumferential surface of rod was above level of liquid. Wire was then plated, thus forming sheathing of copper on each turn for approximately half its length. When junctions along one side of cylinder were heated above temperature of those on opposite side contrivance behaved as thermopile having large number of junctions in series.

Needle Type. Some Improvements on the Needle Type Thermocouple for Low Temperature Work, George F. Taylor. Jl. Indus. and Eng. Chem., vol. 12, no. 8, Aug. 1920, pp. 797-798, 1 fig. Types described in article have temperature range of not higher than 70 deg. cent., but it is believed range could be increased by using some other alloy.

THERMODYNAMICS

Black Body. See BLACK BODY.

Clausius-Rankine Cycle. See STEAM ENGINES, Clausius-Rankine Cycle.

Heat Cycles. Fundamental Laws for the Conversion of Heat (Grundsätze der Wärmeumwandlung), M. Hirsch. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 16 and 17, June 10 and 20, 1920, pp. 181-184 and 193-179, 7 figs. Writer refers to the Lorenz law stating that an increase of entropy is connected with every dispersion of energy within a system, and in connection with those phenomena which convert heat into work and work into heat, writer seeks to develop a reversible cycle without loss of energy.

New Cycle. A New Thermodynamic Cycle, William J. Walker. Eng., vol. 109, no. 2852, Apr. 9, 1920, p. 467, 1 fig. "Dual combustion cycle" in which heat is imparted to working fluid by internal combustion both at constant volume and constant pressure.

Principle of Duality. A Principle of Duality in Thermodynamics, Arthur C. Lunn. Physical Rev., vol. 15, no. 4, Apr. 1920, pp. 269-276. It is shown that general relations in thermodynamics can be arranged so as to exhibit a duality such that energy is dual to entropy and temperature to its reciprocal, leading to a systematic scheme of transformation of variables which may have value similar to the analogous principles already recognized in geometry, mechanics, and electromagnetic theory. Working of principle is illustrated by interrelations of physical coefficients belonging to a fluid, and an example of symmetry of notation for entropy and energy equations and other pairs of formulæ; by transformation of thermodynamic potentials; and by dualistic relation of the two Gibbs criteria of equilibrium and stability.

THERMOELECTRICITY

Currents in Mercury. Thermoelectric Currents in Mercury (Ueber thermoelektrische Ströme in Quecksilber), H. Haga and F. Zernike. Annalen der Physik, vol. 61, no. 8, May 4, 1920,

pp. 753-760, 1 fig. Results of experiments, in author's opinion, refute existence of effect sought by Benedicks, and it is therefore not necessary to alter present theory of thermoelectricity. Report from Physical Inst. of Groningen University.

Thermo-Electricity of Liquid Mercury Demonstrated by Means of Galvanometer (Thermoélectricité du mercure liquide démontrée au moyen du galvanomètre), Carl Benedicks. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 578-581, 1 fig. Negative effect reported to have been obtained by subjecting special glass container of mercury to differences in temperature amounting to 150 deg. cent.

Joule Effect. Expansion Produced by Joule Effect of Contact between Two Solids (Sur la dilatation occasionnée par l'effect Joule au contact de deux solides), Jean Fallou. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 22, May 31, 1920, pp. 1308-1310. It was found experimentally that (1) when a contact of two metals is heated electrically, it expands proportionally to heat developed by Joule effect; (2) coefficient of expansion of contact increases directly with its resistances, and (3) there is no proportion between this coefficient and those of the metals forming junction.

Voltage Measurement. A Precision Galvanometric Instrument for Measuring Thermoelectric E. M. Fs., T. R. Harrison and Paul D. Foote. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 165-176, 11 figs. Scheme is explained whereby ordinary millivoltmeter may be converted into instrument in which usual errors arising from variable line resistance are eliminated. Instrument measures true e.m.f. in simple circuit or if connected across resistance or network through which current flows, it indicates potential drop which would have existed if instrument had not been connected.

THERMOELECTRONIC EMISSION

Theory. Thermoelectronic Emission (L'émission thermo-électronique), F. Wolfers. Journal de Physique, vol. 9, Mar. 1919, pp. 95-114, 8 figs. Theory of thermoelectronic emission.

THERMOMETERS

Mercury. Comparison of a Mercury Thermometer with a Platinum Thermometer (Vergleichungen von Quecksilberthermometern mit dem Platinthermometer), F. Hoffmann and W. Meissner. Zeitschrift für Instrumentenkunde, vol. 39, no. 7, July 1919, pp. 212-224, 2 figs. Deduction of general formulæ. Expansion of mercury between 0 and 100 deg., dependence of inner pressure on temperature, compressibility of mercury and elastic expansion of tube are discussed.

Standardization. A Calorimetric Method for Standardizing Thermometers by Electrical Energy, Theodore W. Richards and Setsuro Tamaru. Jl. Am. Chem. Soc., vol. 42, no. 7, July 1920, pp. 1374-1377, 1 fig. It is shown that a thermometer may be accurately calibrated by successive additions, to a known heat capacity, of heat from electrical energy.

THERMOREGULATORS

Guoy. Some Characteristics of the Guoy Thermoregulator, T. S. Sligh. Jl. Am. Chem. Soc., vol. 42, no. 1, Jan. 1920, pp. 60-68, 1 fig. Describes modification in which fixed contact element is replaced by oscillating contact element. It is claimed that such modification would reduce the periodic variation of bath temperature and erratic variations due to variations of mercury surface to fraction of values obtained with usual form.

THERMOSIT

See SLAG, Pumice Stone from.

THERMOSTATS

Metal for. Thermostatic Metal, Henry Herrman. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 57-59, 6 figs. Development per degree is said to be 18 to 20 per cent greater than that of foreign product.

THICKENERS

See GOLD METALLURGY, Thickeners.

THORIUM

Production in 1919. See MINERALS, Rare-Earth.

THREADS

See SCREW THREADS.

THRUST BEARINGS

See BEARINGS, THRUST.

THRUSTMETER

See AEROPLANE PROPELLERS, Thrustmeter.

TIDAL POWER

Hopewell, N. B. Proposed Tidal Power Development at Hopewell. Elec. Times, vol. 56, no. 1469, Dec. 11, 1919, pp. 462-463, 2 figs. Suggested layout for obtaining continuous power from tides.

Stations. The Theory of Tidal Power Stations, P. Caufourier. Engr., vol. 129, no. 3354, Apr. 9, 1920, pp. 372-373, 7 figs. Diagram of mean effective power computed for following data: Area of basin, 1,000,000 sq. m.; section of sluice, 5.85 sq. m.; half-amplitude of tide, 2 m. at neap tide. Translated from Génie Civil.

System for Utilizing. Tidal Power, A. Struben. Elec. Times, vol. 57, no. 1480, Feb. 26, 1920, pp. 171-173, 8 figs. System is suggested for dividing a tidal estuary into two or more basins by means of dams in which are installed turbines and generators. Sluice gates control water so that it can operate turbines during both ebb and flow of tides.

Theoretical Study of Plant Operated by Tidal Forces (Étude théorique d'une usine actionée par la marée), P. Caufourier. Génie Civil, vol. 76, no. 7, Feb. 14, 1920, pp. 180-182, 7 figs. Scheme is explained where turbines are placed between two parallel canals communicating sea with basin. There are two sluices at extremities of each canal. Opening and closing of suitable pairs of sluices permits rotation of turbines in same direction whether water moves to basin or to sea.

Utilization. Coupling of Electric Plants Utilizing Tidal Power (Couplage d'usines électriques utilisant la force des marées), Georges Mangin. Revue générale de l'Électricité, vol. 7, no. 19, May 8, 1920, pp. 626-631, 6 figs. If plants are built at two different points, so situated that high tide in the one corresponds to low tide in the other, and vice versa, coupling of these two plants, it is observed, will secure continuous supply of water. Construction and coupling of such plants at St. Malo and Brest is studied.

Economical Utilization of Tidal Power (Un moyen économique d'utiliser la force des marées), G. Bigourdan. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 4, July 26, 1920, pp. 211-212. Idea is suggested of utilizing tidal power by means of bell into which air is compressed during flow and and a suction established during ebb.

TIDES

Electrical Disturbances Due to. On Electrical Disturbances Due to Tides and Waves, F. B.

Young, H. Gerhard and W. Jevons. Lond., Edinburgh and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 235, July 1920, pp. 149-159. Experimental results are said to clearly indicate existence of periodic e.m.f.'s in sea whose period and magnitude show them to be result of earth induction in tidal currents; high values obtained from drifting electrodes indicate that the e.m.f.'s due to purely local induction which are measured by moored electrodes is small, and those actually measured by these electrodes are due principally to more remote tidal currents.

Friction of. Tidal Friction in the Irish Sea, G. I. Taylor. Philosophical Trans. of Royal Soc. of Lond., series A, vol. 220, pp. 1-33, 4 figs. Rate of dissipation of energy at low tide is calculated from formulæ for skin friction of wind of rivers on their beds. Results range from 1040 to 1300 ergs per sq. cm. per sec.

Prediction, Machine for. Tide-Predicting Machine. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 832-834, 6 figs. Machine performs mechanically operation of summing series of simple harmonic motions representing various components of tidal motion; algebraic sum of these motions is finally recorded on paper chart in form of continuous graph.

Tidal Currents in Bays. Tides and Tidal Currents in Bays, John P. Jackson. U. S. Naval Inst. Proc., vol. 46, no. 204, Feb. 1920, pp. 193-195. Explanation for phenomenon of strong flood or ebb current continuing to run after high or low water.

TIES

See RAILWAY TIES.

TILE

Drain. An Investigation of Tests of Iowa Shale Drain Tile, W. J. Schlick. Official Publication of Iowa State College of Agriculture and Mechanic Arts, vol. 16, no. 43, Mar. 27, 1918, 71 pp., 18 figs. Method is recommended for conducting sodium sulphate tests which is said to have been found quicker, more convenient and more economical than any of freezing and thawing tests or other sulphate tests described. Method is believed to be well adapted for use by tile manufacturer as rapid approximate determination of whether his products will successfully pass Am. Soc. for Testing Materials standard freezing and thawing requirements for drain tile.

Floor. See CLAY PRODUCTS, Tiles.

Trenching for. See TRENCH EXCAVATION, Machinery for.

TIMBER

Mountain Ash. Timber Production and Growth Curves in the Mountain Ash, Eucalyptus regnans, R. T. Patton. Proc. Roy. Soc. Victoria, vol. 30, no. 1, Sept. 1917, pp. 1-3, 4 figs., partly on two supp. plates. From study of annual rings, it is concluded that mountain ash reaches its maturity between fortieth and fiftieth years, but it is not then fit for milling.

Specifications. Report of Committee D-7, Annual Meeting Am. Soc. Testing Matls., June 22-25, 1920, 13 pp., 1 fig. Proposed revised tentative specifications for structural Douglas fir.

[See also WOOD.]

TIME

Absolute Unit of. Measurement of Absolute Value of Time Based on Newton's Law (Sur la mesure absolue du temps fondée sur les lois de Newton), Gabriel Lippmann. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 226-237. Suggested concept of absolute unit of time.

Measurement of Short Intervals. Measurement of Very Short Intervals of Time (Sur Quelques déterminations de durées très courtes), Ch. de Watteville. Journal de Physique, vol. 9, Mar. 1919, pp. 91-95, 3 figs. Methods for determining (1) duration of combustion of powder, (2) time which elapses between establishment of current in a wire, and inflammation of explosive surrounding wire, and (3) time in which small rectilinear displacement takes place.

The Measurement of Small Time Intervals and Some Applications, Principally Ballistic, L. T. E. Thompson, C. N. Hickman and N. Riffolt. Proc. Nat. Acad. of Sciences, vol. 6, no. 4, April 1920, pp. 169-178, 7 figs. Apparatus which places sharp lines across film at very high frequencies by means of a system of mirrors and a tuning fork.

The Measurement of Very Short Time Intervals, Paul E. Klopsteg. Physical Rev., vol. 15, no. 1, Jan. 1920, pp. 12-23, 3 figs. Describes method in which potential difference of a condenser after it has been discharged for interval of time to be measured, is accurately determined by connecting condenser through a ballistic galvanometer to a known potential difference, which is made nearly the same as that to be measured, so that small throw observed merely measures the small correction to be applied to known potential difference to give the unknown.

Measurement Oscillograph for. The Use of the Oscillograph for Measuring Short-Time Intervals, H. L. Curtis and R. C. Duncan. Physical Rev., vol. 15, no. 6, June 1920, pp. 511-512. Description of timing system to be used in connection with the oscillograph, making it possible not only to record time of occurrence of a number of events but also to measure the corresponding time intervals with an absolute error of less than 0.00001 sec.

Recording. See RADIOTELEGRAPHY, Time Recording.

TIME SIGNALS

See RADIOTELEGRAPHY, Sending Device.

TIME STUDY

Applications. Time Study in an Engineering Works, W. Symes. Eng. & Indus. Management, vol. 3, no. 10, Mar. 4, 1920, pp. 296-298, 1 fig. Method of time study is outlined and, by way of illustration, its application to various machinery operations is explained.

Cutting Time for Planer Jobs. Chart for Computing Planing Time, J. B. Conway. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 351-352, 1 fig. Chart constructed from formula ordinarily used for calculating time required for planing.

Details of. Time and Job Analysis in Management, William O. Lichtner. Indus. Management, vol. 60, no. 1, July 1920, pp. 28-34, 7 figs. Details and technique of taking time studies.

Foundries. Time Study Underlies Bonus System, H. E. Diller. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 682-686, 5 figs. Methods used for determining standard time for different foundry operations and forms used for recording amount of each kind of stock on hand and being consumed at foundry of Saginaw Malleable Iron Co.

Industrial Unrest and. Time Study and Industrial Unrest, Carle M. Bigelow. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 143-145. It is maintained that through time study by means of stop watch and resulting standardization of methods, with rates based on actual living requirements as minimum with opportunity for increased remuneration through performance of task, there lies "the only means of securing the fundamental knowledge necessary to estab-

lish remuneration upon an actual sound basis."

Job Analysis. Time and Job Analysis in Management, William O. Lichtner. Indus. Management, vol. 59, no. 6, June 1920, pp. 487-491, 6 figs. How to prepare ground for analysis by winning over superintendent, showing how to talk to foremen and outlining relationship between analyst and everyone with whom he comes in contact during his work.

Methods. Effective Time Study Methods Increase Individual Production, Norman G. Shidle. Automotive Industries, vol. 43, no. 9, Aug. 26, 1920, pp. 421-425, 5 figs. Methods used by automobile manufacturer.

Mining Operations. Standardizing at North Butte Mining Co., Robert Linton. Min. & Metallurgy, no. 164, Aug. 1920, pp. 31-32, 2 figs. Methods of applying time studies to mining operations. (Abstract.)

Power Shovel. Time Studies for a Power Shovel, Daniel J. Hauer. Eng. and Contracting, vol. 54, no. 7, Aug. 18, 1920, pp. 168-170, 2 figs. Forms used.

Rate Setting. Time and Job Analysis in Management, William O. Lichtner. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 201-207, 2 figs. Possibility is pointed out of employing analyst jointly by employers and employees to secure facts in regard to industrial disputes and reaching a just decision. Reference is made to agreements worked out in garment making industry of New York City in support of this contention.

Stop-Watch Readings. Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 4, no. 5, July 29, 1920, pp. 131-135, 8 figs. Method of recording stop-watch readings. Description of cyclegraph.

Training of Time Analyst. Time and Job Analysis in Management, William O. Lichtner. Indus. Management, vol. 59, no. 5, May 1920, pp. 361-366, 2 figs. Course for training time and job analyst is outlined. Time-study boards and sheets are illustrated and a series of six exercises to be given by an instructor are presented in detail. These are followed by procedure in field work, designated elementary units, recording, and office work.

Unit Operations. Taking Up the Slack in Production, E. T. Spidy. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 392-394, 4 figs. How causes of lost time on unit operations are located and removed at Canadian Pacific Railway Angus shops.

Working Up Time Studies. Time and Job Analysis in Management, William O. Lichtner. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 130-139, 8 figs. How to work up and use time studies. Examples of dangers to avoid and methods to follow.

TIN

Atomic Weight. A Revision of the Atomic Weight of Tin, Bohuslav Brauner and Henry Krepelka. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 917-925, 3 figs. Experiments at Chemical Institute of Bohemian Charles University of Prague. Mean of values found for atomic weight of tin is 118.7.

A Revision of the Atomic Weight of Tin. The Electrolytic Determination of Tin in Tin Tetrachloride, Gregory Paul Baxter and Howard Warner Starkweather. Jl. Am. Chem. Soc., vol. 42, no. 5, May 1920, pp. 905-917, 1 fig. Experiments at Chemical laboratory of Harvard College. Average value of atomic weight of tin found was 118.703.

Bibliography. Bibliography of Recent Articles on Tin, R. R. Hornor. Dept. Interior, Bur. Mines, Monthly Reports of Investigations, Nov. 1919. 8 pp. Articles indexed have appeared in technical literature of England and United States during years 1912 to Nov. 1919.

Conservation. See BEARING METALS, Tin Saving in.

Electrolytic Extraction. The Electrolytic Extraction of Tin from Tin-Plate Scrap. Metal Industry, vol. 15, no. 18, Oct. 31, 1919, p. 372. Precautions to observe while applying Keihl process of submitting tin-plate scrap to electrolytic action in alkaline solution. Translated from Bul. de la Société des Ingenieurs Civils.

Electrolytic Refining of. The Electrolytic Refining of Tin, Edward F. Kern. Gen. Meeting of Am. Electrochem. Soc., Sept. 30-Oct. 2, 1920, paper no. 16, pp. 187-206, 2 figs. Conditions necessary for electrolytic refining of tin and for formation of solid adherent cathode deposits. Tests with various types of electrodes.

Production in 1919. Tin in 1919, J. H. Lang. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 122-123. Statistics of production.

Substitute for. See ALLOYS, Cadmium-Arsenic.

World Production. Tin—Its Political and Commercial Control, James M. Hill. Eng. & Min. Jl., vol. 109, no. 18, May 1, 1920, pp. 1011-1020, 3 figs. It is concluded from statistics of U. S. Geol. Survey that world production was 130,670 metric tons in 1918, of which British directly command 57 per cent. Control of smelting capacity is given as 88,300 tons by British, 16,000 by Dutch, 12,000 by Chinese and 18,000 by United States.

TIN ALLOYS

Tin-Antimony-Arsenic. The Ternary Alloys of Tin-Antimony-Arsenic. Engineering, vol. 108, no. 2811, Nov. 14, 1919, pp. 663-667, 22 figs. Most perfect structural arrangement of crystals is said to have been obtained in alloy containing 70 per cent and 85 per cent tin, 25 per cent and 18 per cent antimony, and 4 to 5 per cent arsenic. Photomicrographs of eutectics of various alloys are shown. Paper read before Inst. of Metals.

Tin-Phosphorus. Tin-Phosphorus Alloys, A. C. Vivian. Metal Industry (Lond.), vol. 16, no. 15, April 9, 1920, pp. 287-292, 5 figs. Account of experiments undertaken to interpret phenomena due to existence of conjugate solutions between certain percentages of phosphorus. Paper read before Institute of Metals.

Tin-Thallium. Thallium-Tin Alloys (Ueber Thallium-Zinn-Legierungen), Paul Fuchs. Zeitschrift für anorganische und allgemeine Chemie, vol. 107, no. 4, July 29, 1919, pp. 308-312, 2 figs. Metallographic report of Institute of Physical Chemistry at Goettingen University. Crystallization curves.

TIN DEPOSITS

New South Wales. The Geology and Mining Developments of the Ardlethan Tin Field, L. F. Harper. Dept. Mines, Geological Survey, Mineral Resources, no. 29, 1919, 32 pp., 7 figs. Geology, nature and probable genesis of ore bodies, suggestions as to prospecting, with notes on past and present mining and prospects of obtaining supply of sub-artesian water.

Tungsten, Association With. Tin and Tungsten Deposits: The Economic Significance of Their Relative Temperatures of Formation, William R. Jones. Bul. Instn. Min. & Metallurgy, no. 186, Mar. 1920, pp. 1-27, 28 figs., partly on 9 supp. plates. Tin and tungsten deposits of the world are classified according to their mode of occurrence, and evidence is presented in support of theory that segregation and contact-metamorphic deposits were formed at higher temperatures than pegmatoid deposits which were themselves formed at higher temperatures than quartz vein deposits, and that replace-

ments deposits were formed at comparatively low temperatures.

TIN MINING

Tin-Tungsten Ore, Tasmania. Mining and Milling Tin-Tungsten Ore in Tasmania, Wm. E. Hitchcock and J. R. Pound. Min. & Sci. Press, vol. 120, no. 7, Feb. 14, 1920, pp. 229-231. Details of methods adopted in development work and ore breaking at S. & M. mine, in northwest Tasmania; geology of district is described. From proceedings of Australasian Inst. Min. Engrs.

TIN ORES

Occurrence. Tin Ores. Metal Industry (Lond.), vol. 16, no. 4, Jan. 23, 1920, pp. 65-66. Occurrence, characters, and uses of various tin ores found throughout the world. From publication issued by Mineral Resources Committee of Imperial Inst., Gt. Britain.

[See also SILVER METALLURGY, Silver-Tin Ore Treatment.]

TIN PLATE

Oil for Manufacture of. The Use of Hydrogenated Oils in the Manufacture of Tin Plate, W. D. Collins and W. F. Clarke. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 149-152. Laboratory heating tests are said to have demonstrated that tin pot using hydrogenated cottonseed oil operated better than palm oil.

TIN PLATING

Alkaline Tin Baths. Tin Plating from Alkaline Tin Baths by the Use of Addition Agents, Frank C. Mathers and William H. Bell. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 6, pp. 41-44. Balsam copaiba, rosin, and to lesser extent, other similar organic fatty acids or acid-containing substances were found to be successful addition agents in producing smooth, adherent deposits of tin from sodium stannite baths.

TINNING

Equipment and Methods of. Equipment and Methods of Tinning, E. P. Later. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 817-820. Pickling processes with details for handling various classes of work.

TIRES

Car-Wheel. See CAR WHEELS, Tires.

Pneumatic. See TIRES, RUBBER.

Rubber. See TIRES, RUBBER.

TIRES, RUBBER

German Expedients. Methods Used by Germany in Overcoming Tire Shortage, H. M. Kistler. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, p. 701, 3 figs. Steel bands cushioned by wood, rubber and steel springs, asphalt composition and jelly-filled shoes.

Manufacture. The Mechanical Building of Pneumatic Tyre Casings. India-Rubber Jl., vol. 58, no. 22, Nov. 29, 1919, pp. 9-10, 2 figs. By Thropp patent tire building machine. Distinct feature of machine is two guide plates which are operated through right- and left-hand screws geared so that turning of one handle brings guide plates closer together or further apart.

Molds for. Machining Molds and Cores for Auto Tires, W. O. Francis. Am. Mach., vol. 52, no. 21, May 20, 1920, pp. 1099-1102, 17 figs. Methods used by some of the large tire manufacturers.

Motor Trucks. Pneumatic Tire and Wheel Equipment for Motor Trucks, J. E. Hale. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 918-921, 2 figs. Discussion of probable change coming in motor truck equipment.

Specifications. Government Standard Specifications for Rubber Tires, Tire Repairs and Accessories. India Rubber World, vol. 61, no. 6, March 1, 1920, pp. 351-353. Specifications cover bicycle, motorcycle and automobile ribbed or non-skid pneumatic casings, solid tires, pneumatic inner tubes and accessories used by War Department.

Standards, British. British Standard List of Rubber Tyres for British Standard Rims. British Eng. Standards Assn., D. L. 8564, 1920, 22 pp., 22 figs. Specifications approved on April 14, 1920.

Substitutes for. Substitute for Rubber Tires (Ersatz für Kautschukreifen), H. Jahr. Kunststoffe, vol. 10, nos. 5 and 6, Mar. 1 and 2, 1920, pp. 49-53 and 64-66, 18 figs. Details of composite bristle, fiber, felt, hair, paper and pasteboard tires, as well as of tires made of mixtures of asphalt, bitumen, concrete, cellulose, wood pulp and similar materials.

[See also MOTOR TRUCKS, Pneumatic Tires.]

TITANIC ACID

Production of. The Production of Titanic Acid and Other Titanic Compounds (Die Herstellung von Titansäure und anderen Titanverbindungen), S. Halen. Edel-Erden u. -Erze, vol. 1, nos. 3 and 4, Nov. 1919, pp. 27-29 and 43-45. Review of various American and European processes.

TITANIUM

Alloys, Electrical Properties. Some Electrical Properties of Titanium Alloys, M. A. Hunter and J. W. Bacon. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, no. 28, pp. 391-401, 2 figs. It was found in tests that addition of titanium to iron improved magnetic quality of iron. Action is attributed to cleansing of material by addition of titanium, because when additions were made in such amounts that titanium was left in iron magnetic improvement was no longer apparent.

Estimation in Iron Ore. Rapid Method for the Estimation of Titanium in Titaniferous Iron Ores, John Waddell. Analyst, vol. 44, no. 522, Sept. 1919, pp. 307-309. Method in use at Queens' University, Kingston, Canada.

Production in U. S. See MINERALS, Production in U. S.

Uses. Industrial Uses of Titanium (Note sur les usages industriels du titane), M. F. Bertrand. Revue universelle des Mines, vol. 5, no. 2, Apr. 15, 1920, pp. 139-155, 7 figs. Comparative analyses of ferrotitanium and ferrocarbotitanium are included.

TOLERANCES

Location of. "Limits" and Their Application i Practice, W. G. Grocock. Eng. & Indus. Management, vol. 3, no. 20, May 13, 1920, pp. 626-628, 5 figs. Writer points out that there is a distinct lack of common understanding of terms employed and a standard nomenclature is badly needed. Notes on location of tolerances, distribution of hole tolerances, minimum difference, and uni-lateral and bi-lateral dispositions.

[See also MACHINE CONSTRUCTION, Tolerances and Allowances; STANDARDIZATION, Tolerances; STANDARDS, Tolerances.]

TOLUENE

Commercial, Purity of. Criteria of the Degree of Purity of Commercial Toluene, John Scott Lumsden. Jl. Chem. Soc., vols. 115 and 116, no. 686, Dec. 1919, pp. 1366-1372. Investiga-

tion undertaken for Explosives Department of Ministry of Munitions for purpose of finding easily applied method for estimating degree of purity of commercial toluene. It was reported that specific gravity of commercial toluene gives fair indication of amount of impurity present.

TOLUOL

Paraffin in, Estimation of. The Estimation of Paraffins and Unsaturated Compounds in Commercial Toluols, H. G. Evans. Jl. Soc. Chem. Indus., vol. 38, no. 23, Dec. 15, 1919, pp. 402T-405T. Investigations by sulphonation method and specific-gravity method.

Production at Gas Plants. The Production of Toluol From Gas Plants, Myron S. Falk. Proc. Am. Soc. Civil Engrs., vol. 45, nos. 8-9-10, Oct.-Nov.-Dec., 1919, pp. 775-793. How production of toluol, which forms base of T.N.T., was increased in United States from 700,000 gal. in 1914 to rate of 32,000,000 gal. per year in 1919.

TOOL-GRINDING MACHINES

Universal Automatic. New Automatic Universal Machine for Sharpening Tools for Lathes, Planers, Slotting Machines, etc. (Nouvelle machine automatique et universelle a affûter les outils de tours, raboteuses, mortaiseuses, etc.), Serge Héranger. Technique Moderne, vol. 12, no. 2, Feb. 1920, pp. 49-56, 12 figs. Also in Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 24-28, 5 figs. Machine carries several grinding wheels and accessory tool-supporting mechanisms which permit sharpening of any machine tool by inexperienced operator. It was used during the war in plant working for French Government, and was designed with a view to saving time lost by experienced workmen while sharpening their own tools.

TOOL MAKING

V-Blocks, Use in. Formulae and Methods for Measuring Work by Means of V-Blocks, W. Richards. Machy. (Lond.), vol. 15, no. 370, Oct. 30, 1919, pp. 148-150, 6 figs. It is assumed that V-blocks used in tool room for setting up work are very accurately made.

[See also STEEL, HEAT TREATMENT OF, Tool Hardening.]

TOOL STEEL

See ALLOY STEELS, Manufacture; Tool Steel; STEEL, TOOL.

TOOLROOMS

Efficiency in. Making the Toolroom Efficient, F. B. Jacobs. Iron Trade Rev., vol. 65, no. 20, Nov. 13, 1919, pp. 1326-1327. It is held that economical tool room practice depends on two principal factors: installing up-to-date equipment, and routing work so that lower priced workmen perform simple operations.

TOOLS

Cutting Edges of. Cutting Edges, R. E. Crompton. Eng., vol. 110, no. 2852, Aug. 27, 1920, p. 292. Table indicating angles for cutting edges of tools or other cutting appliances. Paper read before Eng. Section, British Assn. for Advancement of Science.

Recessing. Recessing Tool Design. Machy. (Lond.), vol. 16, no. 415, Sept. 9, 1920, pp. 708-710, 5 figs. Examples of hand-operated and automatic recessing in tools.

Tempering. See STEEL, HEAT TREATMENT OF, Tempering Tools.

[See also FILES.]

TORPEDOPLANES

See AEROPLANES, Torpedoplanes.

TORPEDO TUBES

Boresighting. Boresighting Submarine Torpedo Tubes, Donald Royce. U. S. Naval Inst. Proc., vol. 46, no. 208, June 1920, pp. 873-889, 8 figs. Method employed of keeping record of boresighting jobs completed is shown by illustration, and from data given, inclination of any single tube can be calculated with all necessary accuracy. Same method, it is claimed, can be applied to stern tubes.

TORPEDOES

Bliss-Leavitt. The Bliss-Leavitt Torpedo, Frank M. Leavitt. Stevens Indicator, vol. 35, no. 4, Oct. 1918, pp. 225-244. Description of the construction of the torpedo with emphasis on the factors affecting construction.

TORQUE METER

See MEASURING INSTRUMENTS, Torque Meter.

TOW BOATS

Steel. Tow Boats and Barges for American Inland Waterways. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 93-95, 8 figs. Construction is practically all of steel, assembled in sizes and shapes to meet requirements of Am. Bur. of Shipping.

TOWERS

Absorption. Resistance of Absorption Tower Packing to Gas Flow, Fred C. Zeisberg. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 765-767. Results of experiments. Paper read before Am. Inst. of Chem. Engrs.

[See also NITROUS GASES, Analysis.]

Transmission-Line. See ELECTRIC TRANSMISSION LINES, Towers, Steel.

TOWN PLANNING

See CITY PLANNING.

TRACK

See RAILWAY TRACK.

TRACK SCALES

See SCALES, Track.

TRACTOR ENGINES

Avery. Avery 2-Plow Tractor Has 6-Cylinder Engine. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 604-605, 3 figs. Engine is vertical, 3 x 4 in., cast in block type, and has detachable cylinder head.

Burt Sleeve-Valve. The Burt Single Sleeve-Valve Petrol Engine. Engr., vol. 130, no. 3372, Aug. 13, 1920, pp. 154-156 and p. 158, 7 figs. Manufactured by Wallace Farm Implements, Ltd., Cardonald, Glasgow, for its "Glasgow" tractor and other agricultural appliances. Sleeve is disposed between piston and walls of cylinder barrel and projects down into interior of crank case where it is formed on one side with pair of flanges. Link engaging between flanges connects sleeve to short-throw crankshaft in such a way that as valve shaft rotates sleeve rotates backwards and forwards through small arc and at same time rises and falls vertically.

Cylinders. See CYLINDERS, Tractors, Machining.

Fordson. Pistons for the Fordson Tractor, Fred H. Colvin. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 675-679, 13 figs. Operations on Fordson piston are outlined and methods of holding piston during different operations are explained.

Heavy-Duty. A Tractor Engine for Heavy Duty.

Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1262-1263, 4 figs. Connecting rod of unusual form, the elimination of breather on crankcase and connecting-rod bearing which is cast in rod are quoted as unique features of new Midwest tractor engine.

Kerosene as Fuel. Kerosene as a Tractor Fuel, John A. Secor. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 140-143 and (discussion), 144, 156. Discusses kerosene tractor-engine development, fuel consumption, regulating heat conditions, etc.

Stearns. Accessibility is Featured in Tractor Engine. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1064-1066, 2 figs. Stearns engine designed for tractor work.

Tests. A Tractor Engine Test, C. A. Norman and B. Stockfleth. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 99-106, 21 figs. Engine was run at series of set speeds at each of which temperature of air to carburetor was held successively at certain fixed temperatures, 70, 85, 100, 120, 160, 200, and 240 deg. fahr. After establishment of desired temperature carburetor was set first for maximum richness of mixture at which engine would run satisfactorily, then for minimum richness. Performance curves derived from these tests are presented.

Waukesha. Some of the Changes in the New Engine Models, J. Edward Schipper. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 702-703, 4 figs. Specifications of Waukesha truck and tractor engine.

Weidely. The Weidely Engine. Motor Traction, vol. 29, no. 768, Nov. 19, 1919, pp. 464-465, 3 figs. Of four-cylinder type, having cylinder cast en bloc and in one with top half of crankcase. Designed for mass production.

Wellman-Seaver-Morgan. Features of Latest Design in New Tractor Engine. Automotive Industries, vol. 42, no. 16, Apr. 15, 1920, pp. 896-897, 2 figs. The Wellman-Seaver-Morgan Co. power plant, constructed on design by Joseph Van Blerck, is described as a 4-cylinder block type engine, with cylinder block cast integral with top half of crankcase, the casting also incorporating upper portion of flywheel housing.

[See also MOTOR TRUCKS, Engines.]

TRACTORS

Army Light Artillery. The New Army Light Artillery Tractor, G. R. Pennington and S. K. Wellman. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 321-328, 8 figs. Developed to replace six-horse teams which have been used to pull light artillery pieces such as 3-in. and 75-mm. field guns and their caissons. Overall length is 142½ in. and overall width is 58 in. Engine used is White 4¼ in. by 5¼ in. truck model.

British. Description and Features of the British Tractors, M. W. Bourdon. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 852-859, 11 figs. Based on examination of types exhibited at Lincoln trials.

Bull Gears. Discussion of Materials for Tractor Bull Gears, W. H. T. Thornhill. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 570-573. In plea for better tractor, writer takes up problem of blanks for transmission and discusses in turn advantages and handicaps of cast iron, cast semi-steel, cast steel, forged steel and rolled steel. Each material is discussed from service and construction viewpoint.

Case. Case Designs Production Machines for Unit Frames, P. M. Heldt. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 562-568, 12 figs. Outstanding feature of Case farm tractors is "unit" frame casting which also serves as bottom half of engine crankcase, bottom half of transmission case and rear axle housing. Special machines built to perform major operations on this crane casting are described and illustrated.

Caterpillar. Caterpillar Gearing for Agricultural Power Machines and Its Advantages and Disadvantages in the Cultivation of Soil (Der Raupenantrieb an landwirtschaftlichen Kraftmaschinen und seine vor- und Nachteile bei der Bodenbearbeitung). Automobil-Rundschau, vol. 19, nos. 15-16 and 17-18, Aug. and Sept. 1920, pp. 153-155 and 172-174, 17 figs. Discussion of the technical development of caterpillar system and details of various construction types.

See also COAL MINING, Caterpillar Tractor Haulage.

Caterpillar Tractor Construction. Caterpillars and Their Construction, K. H. Condit. Am. Mach., vol. 52, nos. 1, 5, 6 and 7, Jan. 1, 29, Feb. 5 and 12, 1920, pp. 33-36, 10 figs.; 233-237, 13 figs.; 287-291, 7 figs.; 343-348, 17 figs. Jan. 1: Track details. Jan. 29: Transmission details of 120-hp. Holt tractor. Feb. 5: Features of engines used. Feb. 12: Methods of assembly.

Cletrac. Building a Small Track-Laying Tractor, Fred H. Colvin. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 407-410, 11 figs. Methods used in building Cletrac tractor.

Crawler. The Engineering Fundamentals of the Crawler Tractor, Joseph Jandasek. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1344-1347, 7 figs. Writer endeavors to furnish basis for working out necessary mathematical problems that arise in design of this type of tractor.

Darlington Show. See FARM MACHINERY, Darlington Show.

Design. Analysis of Fundamental Factors Affecting Tractor Design, Oliver B. Zimmerman. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 7-12, 15 figs. Theoretical study of effects of slopes and weights on drawbar pull.

Tractor Weight and Drawbar Pull, A. F. Moyer. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 232-234, 4 figs. Design considerations for selecting ratio of tractor weight to drawbar pull in any given case.

Drawbar Pull. Increased Drawbar Pull as Related to Rearing in Tractors, P. M. Heldt. Automotive Industries, vol. 42, no. 24, June 10, 1920, pp. 1298-1299, 1 fig. According to writer's theory a tractor can "rear" only around its rear axle and not around center line of ground contact, and he opposes belief that tractor can turn over backward with its center line of rear wheel contact as an axis and that drawbar pull causes rearing. Blocked driving wheels, it is stated, are usually the cause.

Tractor Drawbar-Pull, E. A. White. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 394 and 400. Table giving pull in pounds per ton required to move wagons over different surfaces. From Farm Implement News.

Engines. See TRACTOR ENGINES.

Farm. Agricultural Tractors in 1919 (La culture mécanique en 1919), G. Coupan. Génie Civil, vol. 75, nos. 23, 24, 25 and 26, Dec. 6, 13, 20 and 27, 1919, pp. 557-565, 593-599, 617-622 and 645-648, 58 figs. Types developed by the Société des Automobiles Delehaye. Dion-Bouton, Filet-Douilhet, Puech and Filtz-Grivolas.

Studies of the Control and Seating Arrangements of Tractors, P. M. Heldt. Automotive Industries, vol. 42, no. 19, May 6, 1920, pp. 1051-1055, 15 figs. Tractor seats and control of American tractor are illustrated. Tendency to adhere to cast-steel seat said to be due to

fact that tractors are left in the open and are therefore subjected to all weather conditions.

Technical Specifications of American Farm Tractors. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 160-169. Trailers, semi-trailers and motor cultivators are also included.

The Testing of Farm Tractors, Charles H. Benjamin. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 101-102 and 132, 2 figs. Tractor testing plant at Experiment Station of Purdue University. Plant consists of three elements, treadmill, traction dynamometer and absorption dynamometer, and is said to be capable of testing tractors weighing as high as 12,000 lb. on driving wheels and giving drawbar pull of 5000 lb. at speed of not over 5 m.p.h.

See also Plowing Speeds.

Fiat. Fiat Mountain Tractor (La trattrice Fiat da montagna). Ingegneria Italiana, vol. 6, no. 132, July 22, 1920, pp. 26-27, 3 figs. Tractor is used for transport of heavy locks of marble. Load capacity is 30 tons on roads which are very rough and have gradients up to 40 per cent.

Fifth National Show. Technical Features of the Fifth National Tractor Show, P. M. Heldt. Automotive Industries, vol. 42, no. 9, Feb. 26, 1920, pp. 543-550, 10 figs. Writer finds that tractor development of last year has been in small details, refinements and in making mechanical parts more accessible. Changes on older machines and features of new designs are pointed out.

Four-Wheel-Drive vs. Caterpillar. Four-Wheel-Drive vs. Caterpillar Tractor, E. R. Greer. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 385-387 and (discussion) pp. 387-389, 5 figs. Based on experience of U. S. Army. It is claimed that lighter weight is possible with four-wheel-drive construction than with either caterpillar or rear drive.

Graham. New 1½-Ton Graham Built for Speed in Deliveries. Commercial Vehicle, vol. 22, no. 3, Mar. 1, 1920, p. 99, 1 fig. Specifications: Wheelbase, 133 in.; front tires, 35 by 5; rear tires, 36 by 6; bore, 3¾ in.; stroke, 5 in.; N. A. C. C. hp., 22.5; speed r.p.m., 1400; speed m.p.h., 22; gear ratio in high gear, 7 to 1; final drive, int. gear.

Magnet Three-Plow. Unit Construction of New Tractor Facilitates Production, P. M. Heldt. Automotive Industries, vol. 42, no. 14, Apr. 1, 1920, pp. 799-801, 4 figs. Three-plow machine of Magnet Tractor Co. with worm drive and special type of tangential spoked wheel.

One-Man. A One-Man Combination of Tractor and Tool. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1254-1256, 6 figs. Track pull is single drive track in front; engine, radiator, transmission, etc., are all mounted on single main frame casting and track is driven under this mechanism.

Parts, Heat-Treating. See STEEL, HEAT-TREATMENT OF, Tractor Parts.

Plowing Speeds. Ottawa Beach Plowing-Speed Tests. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 274-276, 7 figs. Tests were conducted to determine most desirable tractor speed for plowing.

Tractor Plowing Speeds, Oliver B. Zimmerman. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 133-137, 10 figs. Characteristic curves of performance are developed from published draft data of Prof. Davidson of Ames, Iowa, and those of Kansas State Agricultural College. It is concluded that acreage plowed decreases markedly with increased speed to such an extent that correction in moldboard design or reductions in weight cannot overcome deduction "that the lower speeds are more desirable than the higher."

Rail-Traveling. Transformation of Automobile Vehicles into Tractors on Rails by Army in the Orient (La transformation de voitures automobiles en tracteurs sur rails à l'armée d'Orient). Génie Civil, vol. 75, no. 22, Nov. 29, 1919, pp. 529-531, 5 figs. Experience is discussed in light of requirements which must be satisfied by automobile designed for operation on rails.

Rating of. Rating Tractors on Piston Displacement. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, p. 334. Possibility of drawing up formula to compare different tractor engines. Reference is made to results obtained in tests conducted at Central States Tractor Demonstration at Evansville, Ind., in Oct. 1919, and Ohio State University tractor tests, Jan. 1920.

Samson. Mechanical Details of the $650 Samson Tractor. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 772-773, 1 fig. Tractor is of backbone type, transmission and rear axle housing being in one and bolted on flywheel housing.

Steam. Liquid-Fuel-Fired Steam Motor Wagon. Eng., vol. 109, no. 2837, May 14, 1920, pp. 644-645, 5 figs. Application to steam motor wagon of liquid-fuel firing on pressure-jet system.

Steering System. An Analysis of Creeper Type Tractor Steering, E. F. Norelius. Automotive Industries, vol. 42, no. 18, April 29, 1920, pp. 1005-1008, 7 figs. Mechanical study of force and stresses developed in tractor while steering. Proper kind of steering device, it is concluded, is one which has control of gear ratio between one track and the other, so as to force machine to turn, and one which has free mechanical or electrical drive from one side to the other so that the negative pull on inside track will help outside track.

Superheated-Steam. The Superheated Steam Tractor, A. Dahme. Eng. Progress, vol. 1, no. 2, Feb. 1920, pp. 63-66, 8 figs. Description of a combined steam tractor and locomobile engine.

Testing. Nebraska Makers' Rules for Tractor Tests. Motor Age, vol. 37, no. 3, Jan. 15, 1920, pp. 44-45 and 51. Official rules governing trials of farm machines.

Tractor Testing from the User's Standpoint, Leon W. Chase. Jl. Soc. Automotive Engrs., vol. 6, no. 1, Jan. 1920, pp. 44-46, 2 figs. Apparatus used at University of Nebraska for making drawbar-horsepower tests. Apparatus is called Nebraska dynamometer car and is composed of Illinois tractor chassis with Foote transmission, electric dynamometer placed in frame in place of engine and an electrical resistance substituted for radiator.

See also Farm.

Trailers. Carrimore Trailers. Motor Traction vol. 30, no. 782, Feb. 23, 1920, pp. 169-170, 7 figs. Details and illustrations of some representative productions of Carrosserie Latymer, Ltd.

Uses of. Increasing the Utility of the Tractor, Arnold P. Yerkes. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 226-230. Efforts of manufacturers to secure adaptability of tractors to other uses than plowing are related and it is pointed out that reason why sales of tractors have not been as extensive as manufacturers had anticipated is because of financial inability of farmers in small farms to invest in a machine from which they cannot derive service in proportion to their investment.

Wallis. New Tractor of Unit Construction Has Low Weight. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1397-1400, 5 figs. Wallis model K tractor. Weight is said to be kept well below average for machines of its rating by means of specially designed U-frame

which serves as supporting member as well as housing.

W.-S.-M. New Tractor of Frameless Type Has Unit Construction. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 948-950, 6 figs. Wellman-Seaver-Morgan Co., tractor, of frameless or backbone type, has three-speed change gear, first reduction by worm and wheel gear, and is short for size of engine carried, wheelbase being only 75 in. Engine is of four-cylinder block type, 4¾x6 in.

Weight-to-Pull Ratio. Relation of Tractor Weight to Pull. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, p. 329. Percentage of total weight delivered in drawbar-pull under various conditions, as determined in tractor trials carried out at Lincoln, England. From Farm Implement News.

[See also CONNECTING RODS, Machine; LOCOMOTIVES, Gasoline; STEEL, HEAT TREATMENT OF, Tractor Parts.]

TRACTORS, FARM

See TRACTORS, Farm.

TRACTORS, MILITARY

See TRACTORS, Army Light Artillery.

TRADE MARKS

Use and Importance of. The Use of Trade-Marks, Chesla C. Sherlock. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1097-1098. It is pointed out that words, symbols, or devices descriptive of quality, characteristics or ingredients of article under which it is sold, are not subject matter of trade mark; that manufacturer will be protected in use of protective word or symbol when it has acquired secondary meaning to public; and that manufacturer will be protected against imitation of device when use is shown to be in manner to deceive public as to origin of article.

TRADE UNIONS

American and British. Trade Unions Jealous of Privileges and Precedents, Harry Tipper. Automotive Industries, vol. 43, no. 1, July 1, 1920, pp. 32-33. Difference between American and British trade union movements.

Federal Incorporation. Industrial Stability by Federal Incorporation of Trade and Labor Associations, John Stephen Sewell. Manufacturers Rec., vol. 76, no. 22, Nov. 27, 1919, pp. 113-117. Suggests plan which involves enactment of legislation to stabilize relations between capital and labor in interest of general good. Representations of capital and labor in consultation with legislators are to establish scale of wages and prices, which having been fixed makes strikes, boycotts, etc., punishable as conspiracies "without depriving the individual workman of his right to quit or change his employment, nor the individual employer of his right to discharge or employ individual workmen."

Future of. What Are We Likely to Do About Labor Unions? E. H. Fish. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 109-112. It seems to writer that securing by labor of "a larger share of proceeds of its own production" by violence "had to be gone through as a part of the education of employers, and also partly as education for workmen." He believes that "this sort of revolution . . . can stop whenever each side is convinced that it has measured its opponent's strength," and "when each side respects the other."

Temperament and. Trade Unionism and Temperament, E. E. Southard. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 265-270. Suggestion is advanced that studies both by psychiatrists and psychologists will contribute much to our understanding of trade unionism which, it is believed, may be manifestation of mass psychology. Paper read before Nat. Committee for Mental Hygiene.

TRAILERS

Camp, Folding. Folding Camp Trailer for Road Maintenance Work. Eng. & Contracting, vol. 53, no. 2, June 2, 1920, pp. 637-638, 3 figs. Trailer consists of a special express body mounted on two standard board wheels equipped with pneumatic tires; on each side of body is hinged a double cot bed spring which can be folded in for traveling and folded out to form comfortable bed for two men when ready to pitch camp.

See also MOTOR TRUCKS, Trailers; TRACTORS, Trailers.

TRAIN BRAKES

See BRAKES.

TRAIN CONTROL

Automatic. See RAILWAY OPERATION, Automatic Train Control.

TRAIN FERRIES

Channel, Bridge for. English Channel Train Ferry Bridge of 120-Foot Span, P. J. Risdon. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 666-668, 3 figs. Details of trusses, lifting tower, operating apparatus and mooring provisions.

TRAIN HEATING

Steam Pipes, Insulation. Insulating Train Steam Pipes, W. N. Allman. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 711-712. Discusses relative efficiency of various types of coverings.

TRAIN LIGHTING

See CAR LIGHTING.

TRANSATLANTIC FLIGHT

See FLIGHT, Transatlantic.

TRANSCONTINENTAL FLIGHT

See AVIATION, Transcontinental Flying.

TRANSFORMATIONS

Involutorial. Certain Types of Involutorial Scale Transformations, F. R. Sharpe and Virgil Snyder. Trans. Am. Math. Soc., vol. 20, no. 3, July 1919, pp. 185-202. Such as pencil of quadrics in (x) and pencil of planes in (x).

TRANSFORMERS

Autotransformers, Motor-Starting. Auto-Transformers for Motor Starting, Theo. Schou. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 473-475, 3 figs. Considerations in design of autotransformers for synchronous and induction motor starting. Influence of voltage tap and speed of motor on cost of starter.

Circuit Diagrams. New Method for Derivation of Transformer Circuit Diagrams (Eine Neue Methode zur Herleitung der Transformatoren-Kreisdiagramme, Heyland-u. Osanna-Kreise), J. Goldstein. Schweiz. Elektrotechnischer Verein Bulletin, vol. 11, no. 1, Jan. 1920, pp. 1-12, 3 figs. The Heyland and Osanna circuits. Integration of differential equations of problem. Writer concludes that distribution is closely allied with transformer and induction motor problems.

Connections. Single-Phase Load on a Three-Phase Power System, J. B. Gibbs. Power, vol. 51, no. 14, Apr. 6, 1920, pp. 552-553, 6 figs. Analysis of schemes for connecting a single-phase

load to a three-phase system, including open-delta connection, closed-delta with one secondary reversed, and Scott connection with secondaries in series.

Three-Phase Power from Single-Phase Transformer Connections, J. B. Gibbs. Power, vol. 51, no. 17, Apr. 27, 1920, pp. 672-674, 8 figs. Discusses number of different ways of grouping single-phase transformers to step up or step down three-phase voltages, and their relative advantages and disadvantages are pointed out.

Construction. Construction and Application of Potential and Current Transformers. Elec. Rec., vol. 26, no. 4, Oct. 1919, pp. 217-221, 34 figs. Including dry-insulated, oil-insulated and busbar pipes built by General Elec. Co., at Schenectady.

Cooling. Cooling of Transformer Windings After Shut-Down, V. M. Montsinger. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1056-1065, 12 figs. Advantages and disadvantages of various possible methods of determining temperature correction for cooling of transformer windings after shut-down.

Experience with Transformer Cooling Methods, G. E. Armstrong. Elec. World, vol. 75, no. 10, March 6, 1920, pp. 541-542, 3 figs. Comparison of cooling methods in common use. Circulation of transformer oil through exterior cooling coils offers, in opinion of writer, best solution for cooling problem.

Design. Designing Transformers (Het ontwerpen van transformatoren), A. M. A. Wijnans. Ingenieur, vol. 34, no. 43, Oct. 25, 1919, pp. 787-795, 8 figs. With special reference to Pohl's and Feldman's method of calculation. Designing core transformers with rectangular or with elliptic core sections. Factors influencing costs. Berry transformers.

Electric-Furnace. See ELECTRIC FURNACES, Transformers for.

Heating. The Heating of Transformers, M. Vidmar. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 525-526. Formulæ for computing internal temperature fall both in non-impregnated and impregnated copper coils. Translated from Elektrotechnische Zeitschrift.

Instrument. British Standard Specification for Instrument Transformers. British Eng. Standards Assn., no. 81, Oct. 1919, 11 pp. Standard frequency adopted is 50 periods per sec., but specifications are also given for transformers for use on systems employing other frequencies.

Testing of Instrument Transformers, F. A. Kartak. Elec. World, vol. 75, no. 24, June 12, 1920, pp. 1368-1370. Analysis of available methods, pointing out particularly those which are most easily applicable under ordinary conditions found by central stations in the field and in their meter shops and laboratories.

Oils for. Specifications for Transformer Oils (Cahier des charges pour la fourniture des huiles de transformateurs). Revue générale de l'électricité, vol. 7, no. 22, May 29, 1920, pp. 727-733, 8 figs. Established by Technical Committee of Syndical Chamber of Constructors of Heavy Electrical Material.

Operation. Alternating Current Dynamic Transformer (Un transformatore dinamico per correnti alternate), A. G. Rossi. Il Nuovo Cimento, vol. 17, nos. 4, 5 and 6, Apr., May, June 1919, pp. 95-132, 9 figs. Expressions determining conditions of operations under various systems of connections.

Overvoltages. Overvoltages Produced by Third Harmonics of Saturation in Three-Phase Transformers (Sur les surtensions crées par les harmoniques 3 de saturation des transformateurs triphasés), R. Swyngedauw. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 8, Aug. 23, 1920, pp. 430-433. Calculation of possible maximum overvoltage.

Polarity Tests of. Tests of Polarity in Transformers (Sur les essais de polarité dans les transformateurs), Paul Girault. Revue générale de l'Électricité, vol. 7, no. 8, Feb. 21, 1920, pp. 251-254. Rule is formulated establishing parallelism between three-phase and continuous operations.

Polyphase Connections. Characteristic of Some Polyphase Transformer Connections, L. F. Blume and R. Bovajian. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1035-1043, 28 figs. Analysis of properties of polyphase connections of both transformers and auto-transformers.

Power. Large Power Transformers, A. G. Ellis and J. L. Thompson. Jl. Instn. Elec. Engrs., vol. 57, no. 285, Aug. 1919, pp. 547-571 and (discussion) pp. 571-591, 35 figs. Progress in size of modern power stations, generating units and voltages. Limiting sizes of transformers is determined by transport, handling and cooling. Price and weight per k.v.a. in relation to method to rated output, frequency, voltage and cooling. Comparison of various types. Influence of war conditions on transformer manufacture.

Some Recent Developments in Power Transformers, W. S. Moody. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 853-864, 16 figs. Writer observes that improvements of self-cooled transformer brought about by development of radiator tank, have made it possible to use self-cooled units in many places where water-cooling would formerly have been considered essential. He describes how special problems involved in design of transformers for electric furnaces were met successfully, and refers to use of conservators.

Steel-Clad. Steel Clad Distribution Transformers, E. G. Reed. Elec. Jl., vol. 17, no. 5, May 1920, pp. 213-218, 22 figs. Process of manufacture at works of Westinghouse Elec. & Mfg. Co.

Testing. Testing Transformers by the Alternating Current Potentiometer, Douglas C. Gall. Elecn., vol. 83, no. 2167, Nov. 28, 1919, pp. 603-604, 4 figs. Description of test made upon current transformer of nominal ratio 1 to 10, secondary full-load 5 amperes.

Three-Phase. How Three-Phase Transformers Operate, J. B. Gibbs. Power, vol. 51, no. 25, June 22, 1920, pp. 1002-1003, 11 figs. How to operate three-phase transformer when one phase becomes damaged.

Voltage Diagrams. Fundamental Principles of Polarity, Phase Rotation and Voltage Diagrams of Transformers, A. Boyajian. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 374-385, 26 figs. Fundamental principles first as applied to single-phase circuits and then to three-phase circuits. Their bearing on parallel operation is discussed and practical problems are solved.

Windings, Tertiary. Tertiary Windings in Transformers, J. F. Peters. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 477-480, 8 figs. Their effect on short-circuit currents.

TRANSPORTATION

Economics. Freight Rates and the Marine Terminal Problem. Freight Handling & Terminal Eng., vol. 6, no. 9, Sept. 1920, pp. 328-332. Economics of transportation. Presidential address before Soc. Terminal Engrs.

Freight, Container System. The Container System of Freight Transportation. Ry. Age, vol. 69, no. 13, Sept. 24, 1920, pp. 515-517, 3 figs. Container is designed so that merchandise may be placed in it at manufacturing plant or in warehouse, container locked and sealed, and then transported by motor truck to railroad, or

to waterway, where container and its contents are transferred to flat car, or to boat, without rehandling materials.

Highway. The Development of an Economic Theory of Highway Transportation, Robert C. Barnett. Eng. & Contracting, vol. 54, no. 9, Sept. 1, 1920, pp. 201-205, 6 figs. Formulæ for cost of roadway, motive power and vehicle elements in determining cost of transportation giving annual tonnage between fixed points.

Inland-Waterway. See INLAND WATERWAYS.

Motor-Truck. See MOTOR-TRUCK TRANSPORTATION.

Rails. See RAILWAYS.

Types of Vehicles. The Bus, the Trackless Trolley or the Trolley Car for Light Traction—Which? L. M. Aspinwall. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 443-445. Suggests that special features of design of each of these types should not be considered as inherent to it, but that they be used in designing new types possessing such of these features as are needed for the kind of service it is required to perform.

Water, Economy of. The Economy of Water Transportation, Secor Cunningham, Jr. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 843-845. Economical conditions are pointed out and construction of project for operation of Illinois River and connecting canals is urged.

TRAWLERS

Diesel-Electric Driven. Diesel-Electric Drive for Trawlers. Motorship, vol. 4, no. 12, Dec. 1919, pp. 32-34, 6 figs. Account of trials of 500-ton fishing vessel with heavy-oil engine and electric transmission for propelling and auxiliary power.

Electrically-Operated. The Mariner: The First Electrically Operated Trawler, John Liston. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 455-463, 17 figs. Characteristics: Length overall, 150 ft.; beam, 24 ft. 3 in.; mean draft, 11 ft. 9 in.; displacement, 500 tons. Propelling equipment comprises two eight-cylinder, four-cycle, 350-r.p.m. Diesel engines, each direct-connected to 165-kw., 125-volt, direct-current generator.

TREES

Vertical Growth of. The Vertical Growth of Trees, R. H. Cambage. Jl. & Proc. Roy. Soc. New South Wales for 1918, vol. 52, pp. 377-384. Tests are said to have established that although boles and branches increase in diameter as young trees grow, there is practically no extension in length of stem among or below branches, at least during first few years.

TRENCH EXCAVATION

Machinery for. Tile-Trenching Machinery, D. L. Yarnell. U. S. Dept. of Agriculture, Farmers' Bul. 1131, 27 pp., 19 figs. Classification of trenching machines, and data on their operation, capacity and cost.

Steam-Shovel. Steam Shovel Digs Sewer Trench in Narrow Space, George C. D. Lenth. Eng. News-Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1064-1066, 5 figs. Illustrating method of excavating trench between footings and under floor of bridge over street.

TRESTLES

Construction. Railroad Trestle Building in Military Operations, Billings Wilson. Military Engr., vol. 12, no. 63, May-June 1920, pp. 293-298, 5 figs. Ready reference of actual working figures for construction where speed is essential factor and permanence with its high factors of safety is subordinate.

Construction Plans. Construction Trestle Plans and Quantity Tables, F. J. Herlihy. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 844-847, 6 figs. Tabulations adapted to wide range of requirements intended to expedite work of estimator, purchasing agent and erection superintendent.

Pile. See PILES, Creosoted.

Railway. See also BRIDGES, RAILWAY, Wooden.

Renewal Under Heavy Traffic. Renewing a Trestle Under Heavy Traffic. Ry. Maintenance Engr., vol. 16, no. 8, Aug. 1920, pp. 301-302, 2 figs. Replacing of open-deck trestle almost entirely of untreated timber by creosoted timber ballasted-deck pile trestle.

[See also BRIDGES, RAILWAY, Wooden.]

TRIGONOMETRY

Spherical-Triangle Computer. A Trigonometric Computer, F. E. Wright. Jl. Washington Academy Sciences, vol. 10, no. 2, Jan. 19, 1920, pp. 29-31, 1 fig. Description of stereographic net for approximate graphical solution of spherical triangles.

TRIMSTONE

See CONCRETE, Trimstone.

TRINITROTOLUENE

Detonating Fuse. See QUARRYING, Cement Rock.

TRINITROTOLUOL

Production from Gasoline. Production of Trinitrotoluol from Gasoline (Ueber die Darstellung von Trinitrotoluol aus Benzin), Ernst Berl and Fritz Ziffer. Petroleum, vol. 14, no. 23, Sept. 1, 1919, pp. 1213-1217, 3 figs. Includes diagrams showing specific weight curves of benzine extract. Article was written during the war, but not released at that time for military reasons.

Substitute for. See EXPLOSIVES, Trinitroxylene.

[See also EXPLOSIVES, TNT.]

TRINITROXYLENE

See EXPLOSIVES, Trinitroxylene.

TRIODE VALVES

See RADIOTELEGRAPHY, Amplifiers; VACUUM TUBES, Three-Electrode.

TROOP TRANSPORTATION

See SHIPS, Troopships.

TRUCKS

Industrial. See INDUSTRIAL TRUCKS.

Motor. See MOTOR TRUCKS.

Shop. See INDUSTRIAL TRUCKS.

TRUSSES

Roof. See ROOFS, Trusses for.

Tregillus Type. The Tregillus Truss, H. G. Tregillus. Eng. World, vol. 16, no. 7, May 1920, pp. 397-400, 11 figs. Combination of arch and Bollman truss.

TUBES

Bending. See PIPE, Bending.

Brass, Seamless. Making Seamless Brass Tubes, Otis Allen Kenyon. Iron Age, vol. 105, no. 16, April 15, 1920, pp. 1087-1092, 14 figs. Describes three processes of tube making employed by the Bridgeport Brass Co., piercing, cast shell and cupping.

Brazing. Brazing Steel Tubes and Sheets. Am. Mach., vol. 52, no. 11, Mar. 11, 1920, pp. 543-544. Results of experimental joints made with different brazing metals. Brazing metal containing 83 per cent copper and 17 per cent zinc gave stronger joints. It was also found that joints made with acetylene torch were distinctly stronger than those made in gas flame and that heat-treatment of joints brazed with acetylene gave marked increase in strength.

Drawn Steel. Making Drawn Steel Tubes. Gas Age, vol. 46, no. 4, Aug. 25, 1920, pp. 131-135, 5 figs. Process employed in manufacture of Shelby steel pipe and tubes.

Seamless Copper and Brass. Making Seamless Copper and Brass Tubing. Machy. (Lond.), vol. 16, no. 393, Apr. 8, 1920, pp. 1-6, 15 figs. Description of methods employed and equipment required in production of seamless copper and brass tubes. Photomicrographs are presented showing structure of an admiralty brass tube before and after being subjected to annealing treatment.

Seamless, Manufacture. Manufacturing Seamless Steel Tubes. Blast Furnace and Steel Plant, vol. 8, no. 9, Sept. 1920, pp. 487-493, 14 figs. General description of manufacture of seamless tubing from solid round billets. Cold drawing of seamless steel tubing. Manufacture of seamless steel tubing from flat plates.

The Manufacture of Seamless Tubes with Special Reference to Mannesmann-Process (Ueber die Herstellung nahtloser Rohre unter besonderer Berücksichtigung des Mannesmann-Schrägwalz-Verfahrens), Karl Gruber. Stahl und Eisen, vol. 39, no. 42, Oct. 16, 1919, pp. 1239-1244, 9 figs. Description of continuous tube mill and of process of making seamless tubes.

Seamless Steel. The Manufacture of Solid Drawn or Seamless Steel Tubes. Machy. (Lond.), vol. 15, nos. 378 and 386, Dec. 25, 1919 and Feb. 19, 1920, pp. 399-401 and 653-657, 17 figs. Dec. 25: Table showing length of billet required to produce blooms 10 ft. long. Feb. 19: Methods of manipulating finished tube into various shapes.

Weight of. See CHARTS, Weights of Rods and Tubes.

Welding. See OXY-ACETYLENE WELDING, Tubes.

Weldless. See Seamless Steel.

[See also TUBING.]

TUBING

Copper and Brass. Making Seamless Copper and Brass Tubing, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 6, Feb. 1920, pp. 487-493, 18 figs. Manufacturing methods employed by Wheeler Condenser & Engineering Co., Carteret, N. J.

Making Seamless Copper Tubing. Iron Trade Rev., vol. 66, no. 9, Feb. 26, 1920, pp. 638-641, 7 figs. Plant for producing seamless copper or brass tubing, recently placed in operation by United States Copper Products Corp., Cleveland.

Electric Heat-Treating. Electrically Treated Light Wall Tubing. Iron Age, vol. 105, no. 4, Jan. 22, 1920, pp. 249-251, 3 figs. Process developed by Snead & Co., Jersey City, N. J. Application of nickel-steel tubes, so treated, to automobile shafts is described.

Light Steel, Manufacture. Light Steel Tubing Manufacture and Markets. Raw Materials, vol. 2, no. 4, April 1920, pp. 147-150, 5 figs. Manufacturing details of light steel tubing, and methods of welding steel tubing seams.

[See also TUBES.]

TUFA

Volcanic, Uses of. Volcanic Tufa and Its Uses, A. L. Shaw. Professional Memoirs, Corps Engrs., U. S. Army and Engr. Dept. at large, vol. 11, no. 58, July-Aug. 1919, pp. 430-442, 12 figs. It is suggested to undertake series of careful and impartial tests in government or university laboratory with a view to determine uses to which puzzolana can be put in marine construction.

TUGS

Diesel-Engined. Morin and Avre Tugs Propelled by Diesel Motors (Remorquers à moteur Diesel types Morin et Avre). Bulletin Technique du Bureau Veritas, vol. 2, no. 3, Mar. 1920, pp. 46-50, 6 figs. Built for river service by French Ministry of Public Works. Morin has Sulzer 420-hp. motor and Avre Polar-Diesel 350-400-hp. motor.

Reinforced-Concrete. Reinforced Concrete Tug. Engineer, vol. 128, no. 3335, Nov. 28, 1919, pp. 544-546, 7 figs. Dimensions: Length, 125 ft.; breadth, 27 ft. 9 in.; depth molded, 14 ft. 9 in.; displacement, 685 tons. Tensile stresses adopted on materials are quoted.

TUNGSTEN

Deposits. Notes on Tungsten Ore Deposits in Burma, J. Coggin Brown. Jl. Soc. Chem. Industry, vol. 39, no. 4, Feb. 28, 1920, pp. 44T-48T. Ore-bearing veins are described as being associated with granite intrusions. Statement that field is characterized by universal presence of tourmaline is declared incorrect.

See also MINERALS, Deposits, Idaho; TIN DEPOSITS.

Mining, China. Tungsten Mining in China, Robert Slessor. Eng. & Min. Jl., vol. 109, no. 5, Jan. 31, 1920, pp. 344-345. Operatives recover bismuth as by-product. Large-scale production is reported to have ceased with signing of armistice in 1919.

Occurrence. Political and Commercial Geology Series No. 1—The Tungsten Resources of the World, Frank L. Hess. Eng. & Min. Jl., vol. 108, no. 18, Nov. 1, 1919, pp. 715-722, 1 fig. Geographical distribution, indicating control exerted by principal nations.

Ore Treatment, Suan, Korea. Technical Operations on the Suan Concession, Korea, A. R. Weigall and J. F. Mitchell-Roberts. Min. & Sci. Press, vol. 119, no. 26, Dec. 27, 1919, pp. 915-924, 4 figs. Treatment of tungsten ore at Suan Mill.

Powdered. The Manufacture of Pulverized Tungsten in France (La fabrication du tungsténe en poudre en France). Jl. du Four électrique, vol. 29, nos. 7 and 8, May 1 and 15, 1920, pp. 62-63. Purification is effected directly on mineral, instead of on tungstic acid. Sulphur, arsenic and phosphorus are eliminated by several roastings and tin and silica by special electromagnetic treatments.

Production. See MANGANESE, Production in 1919; MINERALS, Production in U. S.

Radiation at White Heat. A Study of the Constitution of the Corpuscular Radiation Emitted from Tungsten at White Heat (Zur Frage nach der Konstitution der von Wolfram bei Weissglut ausgesandten Korpuskularstrahlung), H. Baerwald. Berichte der deutschen physikalischen Gesellschaft, vol. 21, no. 13-14, July 30, 1919, pp. 474-478, 4 figs. Writer gives account of investigation which, he claims, is a convincing argument in favor of the Stark theory (Jahrb. f. Rad. u. Elektr., no. 15, 1918), in which it is stated that radiation from wires at white heat is similar to that from canal rays. Report from Physical Inst. of the Technical High School at Darmstadt.

Röntgen Spectrum of. The Röntgen Spectrum of Tungsten (Ueber das Röntgenspektrum von Wolfram), Manne Siegbahn. Physikalische Zeitschrift, vol. 20, no. 23, Dec. 1, 1919, pp. 533-536. Writer seeks to obtain as exact and complete measurement of the Röntgen spectrum as is possible, in view of fact that a comparison of results of measurements set forth by different authors shows rather marked differences.

Smelting and Leaching. Manufacture of Pure Tungsten Metal—Operations at the Fansteel Products Company, Chester H. Jones. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 9-16, 16 figs. Smelting and leaching ore. Production of ammonium paratungstate, tungstic acid, and oxides. Reduction operations and design of furnaces used to secure pure metal. Working qualities of product. Future markets.

Wire. Methods of Drawing Tungsten Wire (Das Ziehverfahren für Wolframdrähte), Albert Ohnstein. Elektrotechnischer Anzeiger, vol. 36, no. 139, Nov. 29, 1919, pp. 659-660. Phosporus content of 0.02 per cent is said to remove the characteristic alternating-current structure of tungsten wire without diminishing its tensile strength. Accounts of two different methods, one hot and the other cold, by the Julius Pintsch Co. and the N. V. Philips Incandescent Lamp Co., respectively.

TUNGSTIC ACID

Manufacture. The Manufacture of Tungstic Acid (Die Herstellung von Wolframsäure), O. Kausch. Edel-Erden u. -Erze, vol. 1, no. 9, Feb. 1, 1920, pp. 97-99. Review of numerous American and European processes for the manufacture and purification of tungstic acid.

TUNNELING

Military. See MINING, MILITARY, Tunneling.

Shovels and Conveyors for. See EXCAVATORS, Use in Tunneling and Mining.

TUNNELS

Arches in. Determination of the Load to be Supported by a Projected Subterranean Arch (Sur la détermination des efforts auxquels les voûtes des souterrains sont appelées à résister), M. Suquet. Annales des Ponts et Chaussées, vol. 54, no. 1, Jan.-Feb. 1920, pp. 96-103, 3 figs. General formula is developed and its application to special cases explained.

Catskill Watershed. Shandaken Tunnel for the Catskill Watershed for New York City, Harry Gardner. Eng. World, vol. 16, no. 2, Jan. 16, 1920, pp. 65-71, 10 figs. Tunnel designed to convey 600,000,000 gal. per day. Concrete proportions, one to seven by volume.

Design. The Importance of Design in the Construction of Railroad Tunnels (Die Bedeutung des Bausystems bei der Ausführung von Eisenbahntunneln), K. Imhof. Schweizerische Bauzeitung, vol. 75, no. 24, June 12, 1920, pp. 261-263, 2 figs. Discussion of C. Andreae's work published in same journal (vol. 75, nos. 3 and 4) on behavior of mountain after completion of intervening spaces through heading and excavation of full section, practicability of the different systems, level of advance heading, and method of construction. Brief reply from C. Andreae is appended.

Detroit-Windsor. Tunnels. Ry. Engr., vol. 41, no. 485, June 1920, pp. 263-266, 6 figs. Account of twin tube tunnels joining Canada and United States under Detroit River between Detroit and Windsor.

Driving, Cost of. Cost of Driving 8,700 Ft. of Tunnel by Station Men. Eng. & Contracting, vol. 52, no. 25, Dec. 17, 1919, pp. 689-690. Figures obtained in reconstruction of canal system of irrigation district in Yakima Valley, Wash.

East River, New York. Pneumatic Caisson Tunnel Shafts. Public Works, vol. 48, no. 23, June 19, 1920, pp. 539-542, 5 figs. Steel concrete 34x62-ft. double shafts sunk 80 ft. for installation of eight shields for excavating tunnels under East River at 14th Street, New York. Walls built and sunk in successive operations. Roof of working chamber three times placed and removed.

Hetch-Hetchy Aqueduct. Hetch-Hetchy Aqueduct Tunnel. Public Works, vol. 48, no. 22, June 12, 1920, pp. 508-509, 2 figs. Details of 18-mile concrete lined 11 ft. 3 in. x 11 ft. 3 in. rock tunnel through Sierra-Nevada mountains, which is to deliver 400,000,000 gallons of water to San Francisco daily.

Hudson River. See Vehicular, Hudson River.

Irrigation. See IRRIGATION, Gunnison Tunnel.

Lining. Concrete Lining for Cast Iron Tunnel. Public Works, vol. 49, no. 12, Sept. 18, 1920, pp. 247-249, 5 figs. Details of construction of single track tunnels of Rapid Transit System extension across East River. Notes on mixing and transporting concrete, which is delivered from shafts in pneumatic pipes and in dump cars drawn by locomotives and hoisted above springing line.

Notes on Tunnel Lining, S. Johannesson and B. H. M. Hewett. Proc. Am. Soc. Civil Engrs., vol. 46, no. 3, Mar. 1920, pp. 426-460, 13 figs. Causes for distortion and displacements of tunnel linings are discussed, and modifications of existing practice are suggested for avoiding them.

New York-New Jersey. See Vehicular, Hudson River.

Railway, Design of. The Importance of Proper Design in the Construction of Railroad Tunnels (Die Bedeutung des Bausystems bei der Ausfuhrung von Eisenbahntunneln), C. Andreae. Schweizerische Bauzeitung, vol. 75, nos. 3 and 4, Jan. 17 and 24, 1920, pp. 24-27 and 35-37, 3 figs. Reference is made to defects in many of Swiss railroad tunnels which, writer claims, might have been prevented if construction had been more scientifically designed and carried out: he considers so-called "Austrian" and "Belgian" systems most satisfactory, but geological and other local conditions should figure in choice of system, and plan should be adopted whereby tunnel should be completed in shortest possible time after excavation had taken place.

Scranton. The Scranton Tunnel. Ry. Engr., vol. 40, no. 479, Dec. 1919, pp. 270-273, 7 figs. Total length is 4747 ft., width 17 ft. clear inside and height 20 ft. above and 2 ft. below rail level. Account of construction.

Unwatering. See PUMPS, Air-Lift.

Vehicular. Concrete Block Vehicular Tunnel Investigation. Public Works, vol. 48, no. 23, June 19, 1920, pp. 549-551. Wide roadway, concrete shell without cast iron and adoption of advanced practice effecting 50 per cent economy are favored.

Danger of Automobile Exhaust Gas, Van H. Manning. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 64-66. Points out that available knowledge concerning effects of carbon monoxide and other injurious gases on human body is insufficient properly to design projected vehicular tunnels. Lines along which further investigation are needed are indicated.

Vehicular, Hudson River. Bridge Versus Tunnel for the Proposed Hudson River Crossing at New York City, J. A. L. Waddell. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, pp. 943-947, 1 fig. Costs are estimated to be:

(For highway bridge $32,500,000; for four highway tunnels $49,000,000; for electric-railway bridge, $34,500,000; for four double-track electric-railway tunnels, $48,000,000; and for eight single-track, electric-railway tunnels, $30,000,000.

Driving with Air the Hudson Vehicular Twin Tubes, Robert G. Skerrett. Compressed Air Magazine, vol. 25, no. 8, Aug. 1920, pp. 9741-9749, 13 figs. Engineering analysis of project which is to cost $28,670,000.

Hudson River Vehicular Tunnel, John F. O'Rourke. Public Works, vol. 48, no. 17, May 8, 1920, pp. 406-408. Writer explains nature of clay in bed of river as he found it in building tunnels therein, and proposed method of replacing soft material by depositing clay from above; also concrete block method of construction.

Largest American Shield Tunnel Designed to Carry Vehicular Traffic Under Hudson River. Eng. News-Rec., vol. 84, no. 8, Feb. 19, 1920, pp. 357-364, 7 figs. Report by Clifford M. Holland, Chief Engineer of New York State Bridge and Tunnel Commission and New Jersey Interstate Bridge and Tunnel Commission. Twin tubes of cast iron, 29 ft. in diameter are recommended. Project is to cost $28,669,000. Operating revenues are expected to amortize cost in 11 years and produce surplus of $66,500,000 in 20 years.

Mathematical Analyses of Concrete Block Tunnels. Public Works, vol. 49, no. 4, July 24, 1920, pp. 75-76. Ring analyses as applied to different types of tunnels proposed for vehicular crossing of the North River.

Water, Repairing. Method of Repairing Water Tunnel with Cement Gun. Eng. & Contracting, vol. 53, no. 19, May 12, 1920, pp. 534-536, 2 figs. Repairing 120-ft. section of defective pressure tunnel on main supply line of Water Department of Tacoma, Wash., with steel reinforcement and gunite.

TURBIDIMETERS

New Type. New Turbidimeter for Solutions of Gelatin, Cellulose, and Varnishes, S. E. Sheppard. Jl. Indus. & Eng. Chem., vol. 12, no. 2, Feb. 1920, pp. 167-169, 3 figs. Essential part of apparatus consists of two superposed opaque line gratings arranged to rotate relatively to each other about axis perpendicular to their plane. Separation of parallel dark bands seen when apparatus is viewed by transmitted light alters continuously as gratings are rotated, so that there is continuous change from extreme visibility to invisibility.

TURBINES

Gas. See GAS TURBINES.

Hydraulic. See HYDRAULIC TURBINES.

Marine Steam. See MARINE STEAM TURBINES.

Steam. See STEAM TURBINES; MARINE STEAM TURBINES.

TURBO-ALTERNATORS

50,000-Kw. Large Turboalternator Built in Foreign Factory, B. Schapira. Elec. Rev. (Chic.), vol. 77, no. 1, July 3, 1920, pp. 15-17, 4 figs. Single-shaft single-shell turbine develops energy to drive 50,000-kw. generator. Three-phase transformer has four low-tension windings that may be connected in series or parallel.

Flux Distribution in Core. Flux Distribution in the Core of a Turbo Alternator, Carl J. Fechheimer. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 669-673, 5 figs. Oscillograms are presented and interpreted.

Vibration in. Troubles from Vibration in Turbo-Alternators, E. V. Amy. Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 1003-1005. How effectiveness of dynamic balances depends on method of mounting machine.

TURBO-BLOWERS

See BLOWERS.

TURBO-COMPRESSORS

See AIR COMPRESSORS, Turbo-Compressors.

TURBO-GENERATORS

Armature Breakdowns. Record of Large Turbogenerator Armature Breakdowns, F. D. Newbury. Elec. Rev. (Chicago), vol. 77, no. 8, Aug. 21, 1920, pp. 287-288. Statement giving analysis of causes of armature failures in large Westinghouse generators. Majority of failures found due to operating hazards originating outside of generators.

Design. Mechanical Design of Large Turbo-generators, M. A. Savage. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 105-108, 4 figs. Attention is directed to compactness of present design in which, it is noted, one pound of material does the work required of five pounds in first 5000-kw. set built in U. S.

Failures of. Failures of Turbo-Generators and Suggestions for Improvements, J. Shepherd. Engineering, vol. 109, nos. 2819 and 2820, Jan. 9 and 16, pp. 43-46 and 95-98, 13 figs. Jan. 9: Mechanical weakness, electrical weakness, heating and fire risk and ventilation difficulties discussed in detail. Jan. 16: Comparisons of electrical power quoted. Paper read before Instn. Elec. Engrs.

Forced Air Ventilation. Steam Turbine Generator Ventilation, Geo. Monson. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 99-105, 5 figs. Reviews development of forced air ventilation for cooling large generators. Advantage of latest system which employs closed air circuit and conserves space by mounting humidifying equipment and air dryers under generator foundation is said to be eliminating numerous station ventilating ducts and quantities of dirt that are always drawn in when outside air is employed.

Speed and Output Limits. Present Limits of Speed and Output of Single-Shaft Turbo Generators, F. D. Newbury. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1233-1242, 4 figs. It is known that output is determined broadly by rotor or stator dimensions. With speeds of 1200 r.p.m. and lower, stator is limiting member, while with higher speeds, rotor is limiting member. To obtain maximum output at given speed rotor proportions must be chosen to properly balance mechanical stresses, rotor ampere turns and flux. Maximum length of core is determined by such factors as ventilation, bearing temperatures, critical speed and limits to weight imposed by forging and transportation facilities.

TURBULENCE

Theory. Theory of Turbulence (Zur Theorie der Turbulenz), Ludwig Hopf. Annalen der Physik, vol. 59, no. 6, Aug. 22, 1919, pp. 538-582, 13 figs. Mathematical formulæ are presented and Reynolds figures are discussed. Writer concludes that these reveal paradoxical result, namely, that unstabilizing disturbance becomes greater on frictional than on non-frictional liquid; whereas, according to writer, a disturbance can never make a frictional stream unstable that would not have same effect on non-frictional liquid.

TURNTABLES

See RAILWAY TRACK, Turntables.

TURPENTINE

Specifications for. Recommended Specifications for Turpentine. Dept. Commerce, Circular of Bur. of Standards, no. 86, Feb. 16, 1920, 11 pp. Prepared and recommended by U. S. Interdepartmental Committee on Paint Specification Standardization.

[See also PAINTS, Thinners for.]

TURRET LATHES

See LATHES, Turret.

TWIST-DRILL SHARPENER

See DRILLS, Twist, Grinding.

TWIST DRILLS

See DRILLS, Twist.

TYNDALL LIGHT

See OPTICS, Tyndall Light.

TYPEWRITERS

Empire. Making the Empire Typewriter, J. H. Rodgers. Can. Machy., vol. 23, no. 3, Jan. 15, 1920, pp. 83-87, 15 figs. Important features of construction are discussed and various manufacturing operations are illustrated.

Manufacture of. Operations in the Manufacture of Typewriters. Machy. (Lond.), vol. 16, nos. 412, 413, 414 and 417, Aug. 19, 26, Sept. 2 and Sept. 23, 1920, pp. 610-616, 643-647, 675-677 and 770-775, 46 figs. Description of methods used by Imperial Typewriter Co., Ltd., Leicester, England.

U

U-BOATS

See SUBMARINES, German.

UNDERGROUND RAILWAYS

See SUBWAYS.

UNEMPLOYMENT

British Unemployment Insurance Bill. The New Unemployment Insurance Scheme. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 247-248. Provisions of British Unemployment Insurance Bill which will come into operation Nov. 8, 1920. Number of persons in United Kingdom insured against unemployment will increase from about 4,000,000 to about 12,300,000.

UNITED STATES

Highways. See HIGHWAYS, United States.

Mineral Resources. See MINERAL RESOURCES, Southern U. S.

Next War and. See NATIONAL DEFENSE.

U. S. ARMY

Aeronautical Work. See AERONAUTICS, Work of U. S. Army.

Construction Division. The Construction Division of the Army, R. C. Marshall, Jr. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 581-601. Summary of work done during world war.

See also BUILDING CONSTRUCTION, U. S. Army.

Engineer Corps. See ENGINEERS, U. S. A.

Engineers and Construction Work. Army Construction and the Corps of Engineers, G. A. Youngberg and C. O. Sherrill. Military Engr., vol. 12, no. 62, Mar.-Apr. 1920, pp. 131-144, 18 figs. Writers are of opinion that effective national defense, sound organization of army, and economy in expenditures for military purposes, all combine in demanding that army construction work, in peace and war, be placed in charge of Corps of Engrs.

Motor Trucks. See MOTOR TRUCKS, MILITARY, U. S. Army.

Signal Corps. See SIGNAL CORPS, U. S. A.

U. S. BUREAU OF MINES

Coal Industry and. See COAL INDUSTRY, Bureau of Mines.

Experiment Stations. Experiment Stations of the Bureau of Mines, Van H. Manning. Bur. of Mines, bul. 175, 1919, 106 pp., 22 figs. Character of work and organization of each of the eleven mining experiment stations established since the creation of the Bureau in 1910.

Filing System. See FILING SYSTEMS, Bureau of Mines.

Research at. See RESEARCH, Bureau of Mines.

U. S. NAVY

Flying Boats. See Flying Boats, U. S. Navy.

Ordnance Plant. See ORDNANCE, U. S. Naval Plant.

UNIVERSAL JOINTS

Design. The Universal Joint. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 411-412, 12 figs. Concerning calculations involved in designing of various types.

Stresses Developed. The Action of Forces in Universal Joints (Das Kräftespiel im Kreuzgelenk), D. Thoma. Schweizerische Bauzeitung, vol. 75, no. 17, April 24, 1920, pp. 187-188, 4 figs. Writer points out that a universal joint transmits to the shafts besides the twisting moment, also periodically changing bending moments as soon as the directions of the two shafts deviate from one another. Determination of kinematic relations and extent of bending moment caused by a given coupling.

UNLOADING MACHINES

Wellman-Seaver-Morgan. See TERMINALS, MARINE, Cargo Handling.

UNREST

See INDUSTRIAL RELATIONS, Unrest.

URANIUM

Activity of. See RADIUM, Uranium, Relative Activity of.

Brannerite. Brannerite, a New Uranium Mineral, Frank L. Hess and Roger C. Wells. Jl. Franklin Inst., vol. 189, no. 2, Feb. 1920, pp. 225-237, 2 figs. Analyses made by U. S. Geol. Survey of mineral obtained from gold placers in Stanley Basin in central part of Idaho.

Production. See MANGANESE, Production in 1919; Minerals, Production in U. S.

Radioactivity of. Radioactivity of Uranium (Sur la radioactivité de l'uranium), Charles Staehling. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1036-1039. Observations made while investigating evolution of uranium into uranium I and uranium II.

Radium and. See RADIUM, Uranium and.

Radium: Uranium Ratio. See RADIUM, Radium; Uranium Ratio.

URANIUM STEEL

Composition of. Uranium Steels (Les aciers à l'uranium), E. Polushkin. Revue de Métallurgie, vol. 17, no. 6, June 1920, pp. 421-437, 16 figs. Results of experiments and photomicrographs. It was found that uranium does not change position of Ac_1 excepting when uranium content is over 7 per cent. Uranium did not affect resistance to shock or resistance to alternate tensions.

V

V-BLOCKS

See TOOL MAKING, V-Blocks, Use in.

VACUUM

High. See PUMPS, Vacuum.

High, Production and Measurement. The Production and Measurement of High Vacua, Saul Dushman. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 672-683, 13 figs. Description of Gaede's diffusion pump, Langmuir's condensation pump, and others of mercury-vapor type. Remarks relative to care and operation of exhaust equipment are given in appendix.

Measurement. See BAROMETERS.

VACUUM TUBES

Absorption of Gases. Absorption of Gases in the Electric Discharge Tube, F. H. Newman. Proc. Physical Soc. of Lond., vol. 32, part 3, April 15, 1920, pp. 190-195, 1 fig. Describes method of showing that absorption of nitrogen takes place in discharged tube when sodium and potassium are used as electrodes.

Amplification Constant. The Dependence of the Amplification Constant and Internal Plate Circuit Resistance of a Three-Electrode Vacuum Tube upon the Structural Dimensions, John M. Miller. Proc. Inst. Radio Engrs., vol. 8, no. 1, Feb. 1920, pp. 64-73, 1 fig. Amplification constant of three electrode vacuum tubes is mathematically derived in terms of physical dimensions of tube. Curves are plotted for predetermining tube amplification constant on this basis.

Audio-Frequency Generators. An Audio-Frequency Vacuum-Tube Generator, J. A. Eyster. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 888-889, 3 figs. Use of three-element vacuum tube for supplying alternating current to conductivity bridge is described and illustrated. Its advantages are set forth and procedure which was followed in construction of such generator described.

Characteristic Curves. Recording the Characteristic Curves of Electron Tubes (Ueber Kennlinienaufnahmen von Elektronenröhren), Robert Jaeger. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 4, Sept. 1919, pp. 361-385, 19 figs. Description and illustrations of apparatus for recording curves. Notes on anomalous course of curves, and the effect and measurement of gas content in the tubes.

Double Grid. The Theory of the Double Grid—An Electrostatic Problem [Zur Theorie der Doppelgitter (Ein elektrostatisches Problem)], Marie A. Schirmann. Annalen der Physik, vol. 62, no. 10, May 28, 1920, pp. 97-106, 2 figs. The constant for a certain arrangement of electrodes in double-grid tubes (the so-called cylinder arrangement) is calculated.

Electric Discharges in. High-Vacuum Discharge (Zur Hochcakuumentladung), J. E. Lilienfeld. Annalen der Physik, vol. 61, no. 3, Feb. 3, 1920, pp. 221-263, 9 figs. For the investigation of high-vacuum discharge in cylindrical paths writer employs subtraction method, instead of the older method in which exploring sounds are used, on tubes sealed off from pump in three different ways. Tables giving results of experiments, and bibliography are included.

Electron Tubes. See ELECTRON TUBES.

Helium Discharge Tubes. Symmetrical Subdivision of Anode Glow in Helium Discharge Tubes, G. M. J. Mackay. Physical Rev., vol. 15, no. 4, sec. series, Apr. 1920, pp. 309-311, 2 figs. When a continuous electrical discharge passes through helium at a pressure of 2 cm., the anode glow may break up into a number of spots more or less regularly distributed.

Input Impedance. Dependence of the Input Impedance of a Three-Electrode Vacuum Tube Upon the Load in the Plate Circuit, John M. Miller. Dept. Commerce, Sci. Papers of Bur. Standards, no. 351, Nov. 21, 1919, pp. 367-385, 9 figs. It is concluded that because of capacities between elements of three-electrode vacuum tubes input impedance depends upon nature of load in plate circuit of tube.

Note on the Input Impedance of Vacuum Tubes at Radio Frequency, Julius Weinberger. Proc. Inst. of Radio Engrs., vol. 8, no. 4, Aug. 1920, pp. 334-339 and (discussion) pp. 340-341, 3 figs. It is shown experimentally that input impedance of three-element vacuum tube at radio frequency is not infinite, as heretofore supposed, but that because of capacitive coupling between input and output circuits within tube itself, input impedance greatly depends on character of output circuit. General effect of inductive and capacitive output circuits is mentioned.

Ionic Valves. See IONIC VALVES.

New Type. A New Discharge Tube That Permits the Emission of All the Rays Originating in the Tube into the Atmospheric Air (Ueber eine neue Entladungsröhre, die den Austritt aller in der Röhre entstehenden Strahlen in die atmosphärische Luft gestattet), W. E. Pauli. Physikalische Zeitschrift, vol. 21, no. 1, Jan. 1, 1920, pp. 11-14, 3 figs. Details of construction of a new type of discharge tube and its use for emission of Röntgen, cathode and canal rays.

Oscillators. The Thermionic Valve as an Oscillator. Wireless World, vol. 7, no. 80, Nov. 1919, pp. 456-457. Court decision which declared that patent of thermionic oscillation valve covers its use not only as radio-detector but as an oscillation generator.

Plate Current. Some Notes on Vacuum Tubes, John M. Morecroft. Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 230-260, 22 figs. Value of exponent connecting plate current and plate grid potentials is experimentally investigated for a number of tubes. It is found to be markedly different for different tubes, and for the same tube at different plate voltages. Capacity and conductance within tubes are also experimentally determined for several tubes.

Pliotron. An Electron-Tube Transmitter of Completely Modulated Waves, Lewis M. Hull. Jl. Washington Acad. Sciences, vol. 10, no. 11, June 4, 1920, pp. 316-323, 2 figs. Type "P" pliotron.

Shortest Waves Produced. The Shortest Waves Which Can Be Produced with Vacuum Tubes (Die kürzesten, mit Vakuumröhren herstellbaren Wellen), H. Barkhausen and K. Kurz. Physikalische Zeitschrift, vol. 21, no. 1, Jan. 1, 1920, pp. 1-6, 5 figs. Notes on length of

waves, hypothesis of the occurrences in interior of tubes and influence of shape of tube. Results of experiments are said to show that shortest possible wave, produced with a 2.1 cm. in diameter Schott tube at 500 volts at grid and very high temperature, was 43 cm. long. Report from Torpedo Inspection laboratory.

Thermionic Valves. See THERMIONIC VALVES.

Three-Electrode. A Method of Using Two Triode Valves in Parallel for Generating Oscillations, W. H. Eccles and F. W. Jordan. Radio Rev., vol. 1, no. 2, Nov. 1919, pp. 80-83, 5 figs. Proposes improvement consisting in arranging two tubes for acting upon flywheel circuit by triode and high-voltage battery symmetrically in every half-period. Paper read before British Assn. for Advancement of Sci.

An Investigation of the Internal Action of a Triode Valve, W. H. Eccles. Radio Rev., vol. 1, nos. 1, 2 and 3, Oct., Nov. and Dec., 1919, pp. 11-20, 10 figs.; 67-77, 6 figs., and 127-134, 5 figs. Technical study of "space-charge effect" due to electric reflections between free electrons, and "shielding action" exercised by control electrode over cathode and space charge near it; suggested theory of gird; effect of fall of potential along the filament.

Calculation of the Constants of the Three-Electrode Thermionic Vacuum Tube, Robert W. King. Physical Rev., vol. 15, no. 4, sec. series, Apr. 1920, pp. 256-268, 6 figs. Reference is made to H. J. van der Bijl experiments with view to finding empirical relations between tube dimensions and electrical properties, which, it is claimed, have been of greatest value in connection with subsequent design of tubes for various purposes; and author attempts to arrive at similar set of relations by a theoretical analysis of the tube. Numerical agreement obtained in most cases is said to be good, and to be usually within limits of variation found among number of tubes of some specifications.

The Kallirontron, an Aperiodic Negative-Resistance Triode Combination, L. B. Turner. Radio Rev., vol. 1, no. 7, April 1920, pp. 317-329, 8 figs. Device consists of combination of circuits, which may be aperiodic, including two ordinary triodes in which secondary emission plays no part, whereby electrical resistance is annihilated. Experimental results obtained with Kallirontron as amplifier are included.

See also ELECTRON TUBES, Development; RADIOTELEGRAPHY, Audions; THERMIONIC VALVES.

Triode Valves. See Three-Electrode.

Tungsten Cathodes. Fundamental Phenomena in Electron Tubes Having Tungsten Cathodes, Irving Langmuir. Gen. Elec. Rev., vol. 23, no. 7, July 1920, pp. 589-596, 8 figs. Writer first treats of fact that electrons impinging on solid surfaces frequently cause emission of relatively large numbers of secondary electrons. He then discusses how such phenomena may play a prominent part in operation of vacuum tubes and describes experiments illustrating these effects.

Two- and Three-Electrode. The Algebra of Ionic Valves, W. H. Eccles. Elecn., vol. 84, no. 2178, Feb. 13, 1920, pp. 162-163, 4 figs. Mathematical expressions of physical conditions in two-electrode and three-electrode tubes.

Types. The Vacuum Tube—An Electrical Acrobat, Pierre H. Boucheron. Sci. Am., vol. 122, no. 3, Jan. 17, 1920, pp. 64-65 and 78-79, 9 figs. Types of vacuum tubes and their uses in commercial and Government work.

Uses. Vacuum Tubes and Their Uses (Les tubes a décharge électronique et leurs applications), P. Letheule. Génie Civil, vol. 76, nos. 18, 19, 20, 21, 22 and 23, May 1, 8, 15, 22, 29 and June 5, 1920, pp. 413-417, 432-435, 453-455, 472-475, 491-492 and 508-512, 36 figs. Theory of three-electrode apparatus. Uses as detectors. Heterodyne method of receiving maintained waves. Operation of triode valve as amplifier. Reinforcement of signals by regulation of return of energy from plate to grid. Details of L. de Forest audion and dynatron.

Uses in Radiotelegraphy. The Vacuum Tube in Radiotelegraphy (Les tubes à vide en radiotélégraphie), M. Brossier. Radioélectricité, vol. 1, no. 1, June 1920, pp. 19-23, 18 figs. Principle of operation of vacuum tubes, their classification, and survey of uses in radiotelegraphy.

[See also ELECTRON TUBES; RADIOTELEGRAPHY. Amplifiers; Audions; Detectors; Vacuum-Tube Receiving Circuits.]

VALENCY

Dependence on Temperature. Dependence of Valency on Temperature (Ueber die Temperaturabhängigkeit der Valenzzahl), Wilhelm Biltz. Zeitschrift für anorganische u. allgemeine Chemie, vol. 109, no. 2, Dec. 23, 1919, pp. 132-144, 3 figs. Results of experiments at the chem. laboratory of the Min. Academy at Clausthal. Tenth report on the systematic study of affinities.

VALUATION

Industrial Equipment. Reconciling Depreciation and Appraised Values of Industrial Equipment, Lester G. Hawkins. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 207-209, 2 figs. Reference is made to instances in which in computing federal income and excess profit taxes, wide discrepancies have resulted between book values of industrial equipment obtained through process of regular depreciation and appraised values of same equipment ascertained by engineering survey. Reasons for these variations are discussed and bases upon which just reconciliation can be worked out are suggested.

Locomotives. See LOCOMOTIVES, Valuation.

Public Utilities. See PUBLIC UTILITIES, Valuation.

Railway. See RAILWAYS, Values for Rate Making; Valuation.

Street Railways. See STREET RAILWAYS, Valuation.

Theories of. Two Conflicting Theories of "Valuation" of Railways and Utilities, Halbert P. Gillette. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 580-582. Court and commission decisions on disputed points relating to value rates are based according to writer, (1) upon assumption that public utility is agent entitled to be recouped for expenditures in behalf of principal, or (2) on assumption that public utilities are not agents, but are subject to law of supply and demand, and that consequently their services are regulated by competition existant or potential. Appraisal correllaries that flow from each of these theories are discussed.

Water Works. See WATER WORKS, Valuation.

[See also APPRAISAL; STREET RAILWAYS, Valuation.]

VALUE

Measure of. See CREDIT.

VALVE GEARS

Double Steam Admission. Poppet Valve Gears and Slide Valve Gears with Double Steam Admission (Ventil und Schiebersteurungen mit doppelter Dampfeinströmung), Kraft und Betrieb, vol. 3, no. 12, Sept. 15, 1919, pp. 137-

138, 6 figs. Discussion and illustration of double steam admissions.

Heusinger Link Motion. Geometrical Calculation of Rocker Arm with the Heusinger Link Motion (Ausmittlung des Voreilhebels bei der Heusinger-Steurung), Paul Ritter. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 36, Sept. 4, 1920, pp. 719-720, 1 fig. States that every curved rocker arm in Heusinger link motion can be geometrically replaced by a straight line; and that a straight line can be so drawn that displacements of the end of lever on the slide valve remain in an unvarying ratio to the distance of lower end of lever from these straight lines measured parallel to slide valve movement.

VALVES

Gate, Electrically Operated. Electrically Operated Gate-Valves, L. P. Coulter. Michigan Technic, vol. 33, no. 2, May 1920, pp. 86-90, 10 figs. It is pointed out that electrical operation presents following advantages over other methods: Adaptability for remote control, ease of attachment to existing valves, and it is not effected by freezing temperatures. Notes on multi-unit drive and the Dean system which are said to be the two types extensively used in this country.

Electrical Operation of Gate-Valves, Peter P. Dean. Proc. Engrs. Soc. of Western Pennsylvania, vol. 35, no. 10, Jan. 1920, pp. 483-493. Also in Elec. Rev. (Chic.), vol. 76, no. 16, Apr. 17, 1920, pp. 641-644. Description of Dean system of valve control which consists of single unit in which are incorporated driving-motor reduction gear and limit trip mechanism. Feet of unit are provided with four holding-down bolt holes of standard dimensions for given range of valves.

Internal-Combustion Engines. See INTERNAL-COMBUSTION ENGINES, Valves.

Pressure-Reducing. Heat Accumulation in Pressure-Reducing Valves and Its Dangers (Wärmestauungen in Druckminderventilen und ihre Gefahren). Autogene Metallbearbeitung, vol. 13, no. 2, Jan. 15, 1920, pp. 13-16, 9 figs. Various arrangements and devices for use with gas bottles are described, but it is claimed that many of existing pressure-reducing valves in use in Germany are not designed with sufficient regard to elimination of dangerous compression heat, and means and methods are suggested for making practical improvements.

Steam. New Devices for Steam Piping (Interessante Neuerung für Dampfleitungen). Schiffbau, vol. 21, no. 17-18, Mar. 17-24, 1920, pp. 528-530, 4 figs. Description and illustrations of a new valve called the Borsig Ideal Valve (A. Borsig Machine Works, Berlin-Tegel), some advantages of which are said to be uninterrupted free passage through valve, avoidance of pressure losses, higher speed and therefore smaller piping, less radiation losses in connection with warm media, reduced cost for attendance and repair, etc.

Stop, Automatic. The Coxon Automatic Stop Valves. Engineering, vol. 108, no. 2809, Oct. 31, 1919, pp. 581-582, 9 figs. Types which will automatically shut off steam in event of burst in steam main or corresponding accident to apparatus to which steam is supplied.

VANADIUM

Occurrence and Uses. Vanadium—Its Occurrence and Utilization, B. D. Saklatwalla. Can. Min. Jl., vol. 41, no. 20, May 21, 1920, pp. 428-429. Brief discussion of technical evolution of the processes of reduction and general properties bearing on such processes. Abstract of paper presented before Am. Electrochemical Soc.

Production. See MANGANESE, Production in 1919; MINERALS, Production in U. S.

VANADIUM STEEL

Phosphorus Content. Method for Estimating Phosphorus in Steel Containing Vanadium, J. Maitchell. Chem. News, vol. 119, no. 3108, Nov. 7, 1919, pp. 212-213. By treating it with potassium permanganate.

VAPOR PRESSURES

Equation. A Vapour Pressure Equation, George W. Todd. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 655-660, 1 fig. Study of equilibrium of vapor in contact with its liquid, making assumptions (1) that all vapor molecules striking liquid surface penetrate it, and (2) that only those liquid molecules which have a velocity greater than a definite critical value, whatever their angles of impact with the surface, penetrate it and get clear.

Estimation. An Accurate Method for the Determination of Vapour Pressure, E. J. Hartung. Trans. Faraday Soc., vol. 15, part 3, June 1920, pp. 150-159, 4 figs. Examination of the differential tensimeter method, result of which shows that measurements may be made with an uncertainty only one-tenth as great as that indicated by Andreae (Zeit. Phys. Chem., 1891, 7, 241), provided that attention is paid to following points: (1) Suitable modification in construction of instrument; (2) proper choice of manometer liquid; and (3) attention to important details in exhaustion of instrument prior to taking a measurement.

VAPORIZATION

Heat of, Calculation. Calculation of Heat of Evaporation from Critical Data (Berechnung der Verdampfungswärme aus den kritischen Daten), W. Herz. Zeitschrift für Elektrochemie, vol. 25, no. 19-20, Oct. 1, 1919, pp. 323-324. Method is described of calculating heat of evaporation of non-associated fluids from critical data and boiling temperature, or from critical pressure and critical density. It is claimed that this method is at times also applicable to associated fluids.

VAPORS

Density Determination. A Comparative Method for Determining Vapor Densities, Philip Blackman. Jl. Physical Chem., vol. 24, no. 4, April 1920, pp. 266-276, 12 figs. Simplified method is suggested.

Formula for. A Formula for Saturated Vapors (Eine Formel für gesättigte Dämpfe). A. Köhler. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 44, Nov. 1, 1919, p. 1097. Formula is presented for saturated vapors which is said to be applicable to vapors from all liquids and in most cases sufficiently exact.

Pressure-Temperature Relations. Pressure and Temperature Relations for Vapor of Liquids, P. B. Williamson. Chem. & Metallurgical Eng., vol. 22, no. 25, June 23, 1920, pp. 1151-1156, 1 fig. Derivation of formulæ and vapor pressure-temperature alignment chart.

Saturated, Specific Heat of. The Specific Heat of Saturated Vapour and the Entropy-Temperature Diagrams of Certain Fluids, J. A. Ewing. Lond., Edinburgh & Dublin Philosophical Mag. & Jl. of Sci., vol. 39, no. 234, June 1920, pp. 633-646, 6 figs. Diagrams constructed for alcohol, benzine and ether.

Tension, Measurement of. An Apparatus for Measuring the Vapour Tensions of Volatile Liquids, A. V. C. Fenby. Chem. Age, vol. 2, no. 45, Apr. 24, 1920, pp. 434-435, 1 fig. Apparatus consists of two similar barometer tubes of special construction fixed to suitable stand

and connected at their lower ends by thick-walled rubber tubing to mercury reservoir which can be raised or lowered. One of these tubes is used as barometer and the other as vapor tension tube.

VEHICULAR TUNNELS

See TUNNELS, Vehicles.

VENTILATION

Air Conditioning. See AIR CONDITIONING.

Air Washing. Further Studies in Methods of Dust Determination, E. V. Hill and Otto W. Armspach. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 391-404 and (discussion) pp. 404-406, 7 figs. Experimental. It was found that all dust is not retained in process of sampling in passing air through water or water spray.

Coal Mines. See COAL MINES, Ventilation.

Mines. See MINES, Ventilation.

Schoolrooms. See SCHOOLROOMS, Ventilation.

Ships. See SHIPS, Ventilation.

Sizing of Ducts and Flues. The Sizing of Ducts and Flues for Ventilating and Similar Apparatus, H. Eisert. Jl. of Am. Soc. of Heat. & Vent. Engrs., vol. 26, no. 3, April 1920, pp. 325-340, 5 figs. Tests of Prof. Rietschel with ducts of widely differing sizes and shapes and air velocities within wide ranges are said to have established that (1) in duct of uniform cross-sectional area coefficient of friction decreases with increase of velocity of flow, and (2) velocity of flow and other conditions being the same, coefficient of friction decreases with increase of cross-sectional area of duct. Results obtained with use of Rietschel coefficient of friction are compared with those obtained with use of Taylor coefficient.

Synthetic Air Chart. Modus Operandi of the Synthetic Air Chart, John R. Allen. Jl. Am. Soc. Heating & Ventilating Engrs., vol. 26, no. 6, Sept. 1920, pp. 597-603, 5 figs. Society Heat. & Vent. Engrs., has adopted synthetic air chart designed by Dr. E. V. Hill for comparing air conditions in any room with standard conditions. Brief explanation from Research Bureau of operation of chart and illustrations of apparatus necessary to make measurements involved.

[See also DUST, Removal from Workrooms; HEATING AND VENTILATION.]

VENTURI FLUMES

Open-Channel Measurements. A Study of the Venturi Flume as a Measuring Device in Open Channels, P. S. Wilson and C. A. Wright. Eng. News-Rec., vol. 85, no. 10, Sept. 2, 1920, pp. 452-457, 6 figs. Experimental work at Cornell Hydraulic Laboratory to obtain data for more rational design of venturi flumes. Loss of head in venturi flume much less than in weir of same capacity range.

VENTURI METERS

Test Curves of. Test Curves of Special Venturi Meter Agree with Theory, W. S. Pardoe. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, p. 589, 1 fig. Constructed from results obtained at University of Pennsylvania.

[See also FLOW OF AIR, Venturi-Meter Calculations; Venturi-Meter Measurement of.]

VIADUCTS

Flat-Slab Construction. An Interesting Type of Flat-Slab Construction. Ry. Age, vol. 68, no. 17, April 23, 1920, pp. 1233-1235, 5 figs. Concrete viaduct of flat-slab type reinforced in four directions, being built by Delaware, Lackawanna & Western to carry roadway over tracks, in separation of grades of Newark Turnpike and tracks.

VIBRATIONS

Engine, Prevention of. See DIESEL ENGINES, Vibrations.

Machinery. The Insulation of Machines for the Avoidance of Noises and Shocks (Isolierung von Maschinen zur Vermeidung von Geräuschen und Erschütterungen), Alfred Schacht. Elektrotechnischer Anzeiger, vol. 36, no. 154-155, Dec. 25, 1919, pp. 731-732, 2 figs. Describes two groups of vibrations generated by every machine during its operation which, it is claimed, must be considered separately when taking precautionary measures for insulation of point of vibration.

Measurement. Instruments for Measuring Vibrations, A. B. Eason. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 658-659, 3 figs. Scheme of operation of vibroscope, vibration microscope, spring vibrators using resonant principle, seismographs and pallographs.

New Optical or Electric Apparatus for Measuring Angular Vibrations (Nouvel appareil optique ou électrique pour le mesure des oscillations de vitesse et des écarts angulaires), A. Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 6, Aug. 9, 1920, pp. 329-335, 3 figs. Apparatus for measuring vibrations of high speed electrical machines. Records of vibrations may be obtained either on a photographic plate by a ray of light emitted from point in vibrating system, or on paper band by perforations produced by electric spark.

Recording Apparatus. New Optical or Electrical Apparatus for Recording and Measuring Vibrations of Rotating Machines (Nouvel appareil optique ou électrique pour l'entrique pour l'enregistrement et la mesure des oscillations de vitesse et des écarts angulaires), A. Blondel. Technique Moderne, vol. 12, no. 8, Aug. 1920, pp. 323-332, 14 figs. Applications to measurement of periodic vibrations, of slow vibrations of large amplitude, and of vibrations of synchronized machines.

Strings. The Vibrations of Taut Strings (Die Schwingungen biegungssteifer Saiten), Otto Schaefer. Annalen der Physik, vol. 62, no. 10, May 28, 1920, pp. 156-164, 3 figs. Investigation of influence of bending rigidity on vibrations of string.

Vehicle, Measurement of. See MOTOR TRUCKS, Vibrations, Measurement of.

VISCOSIMETERS

Construction and Use. The Shop Lubricating Problem, Raymond Francis Yates. Sci. Am. Supp., vol. 88, no. 2288, Nov. 29, 1919, p. 317, 2 figs. Construction and uses of oil viscosity meter.

Falling-Sphere. The Falling Sphere Viscosimeter, William Howieson Gibson and Laura Mary Jacobs. Jl. Chem. Soc., vols. 117 and 118, no. 691, May 1920, pp. 473-478, 1 fig. Apparatus in use in Government laboratories.

Holde, Tables for. Tables for the Holde Viscosimeter (Tabellen für den Holde'schen Zähigkeitsmesser), Karl Scheel. Rohölindustrie, vol. 10, no. 12, Dec. 1919, pp. 213-215. Also in Petroleum, vol. 15, no. 9, Dec. 20, 1919, pp. 353-354. It is pointed out that Holde has supplemented his former measurements with measurements for fluid substances, such as petrolium, benzol and thin lubricating oils, and results of combined old and new measurements are presented in tabular form.

Hydrogen Capillary. The Viscosity of Solutions of Cellulose, William Howieson Gibson. Jl. Chem. Soc., vols. 117 and 118, no. 691, May

1920, pp. 479-493, 3 figs. Description of hydrogen capillary viscosimeter.

Workshop. A Workshop Viscosity Meter. Eng., vol. 109, no. 2833, Apr. 16, 1920, p. 509, 2 figs. Consists of cup with handle and ball, both of same curvature. Oil is poured in cup and ball is then pressed against it. Time in which ball drops clear of cup when instrument is inverted, divided by constant, gives oil viscosity in absolute units.

VISCOSITY

Chart. Chart of Viscosities in Different Systems, H. G. Nevitt. Chem. & Metallurgical Eng., vol. 22, no. 25, June 23, 1920, p. 1171, 1 fig. Chart is arranged to give corresponding viscosities in four systems, Saybolt Universal, Redwood, Engler and Absolute.

Fluid Motion and. Fluid Motion and Viscosity, W. L. Cowley. Eng., vol. 109, no. 2821, Jan. 23, 1920, pp. 101-102, 2 figs. Effect upon fluid motion of local heating due to viscosity, and comparison between experiments carried out in fluids in two different states, liquid and gaseous.

Measurement of. The Macmichael Torsional Viscosimeter. Winslow H. Herschel. Jl. Indus. & Eng. Chem., vol. 12, no. 3, Mar. 1920, pp. 282-286, 5 figs. Essential parts are motor-driven oil cup and torsional pendulum suspended above center of cup by fine piano wire. Pendulum consists of tube enclosing wire and carrying disk at its lower end and dial near point of support.

Viscosity and Viscosity Measurements (Ueber Zähigkeit und Zähigkeitsmessung), Franz Lawaczeck. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 29, July 19, 1919, pp. 677-682, 15 figs. New viscosity meter, said to be simple of operation and absolutely correct, measures fluid, gaseous and consistent bodies. It consists of glass tube holding substance, into which metal body slides. Time required for body to drop is proportional to viscosity of liquid.

Tests. See LUBRICATION, Viscosity Tests.

[See also LUBRICATION, Viscosity Tests in; VISCOSIMETERS.]

VISIBILITY

Measurement of. A Method and Instrument for the Measurement of the Visibility of Objects, Lloyd A. Jones. Lond., Edinburgh, & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp 96-124, 13 figs. Theoretical treatment of problem of determining visibility of an object uniform in color and brightness viewed against background also of uniform color and brightness.

VOCATIONAL EDUCATION

Federal Board for. Training and Placement of Disabled ex-Service Men in the United States. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 138-147. Regulations regarding training and placement adopted by Federal Board for Vocational Education.

VOCATIONAL TRAINING

Blind Soldiers. Vocational Training of War Blinds in Electrical Industry (Utilisation des aveugles de guerre dans l'industrie électrique). Revue Générale de l'Electricité, vol. 6, no. 16, Oct. 18, 1919, pp. 503-506, 4 figs. Experience of French Thomson-Houston company in education of blind soldiers for coil-winding and similar operations.

England. Industrial Training, James Currie. Jl. Roy. Soc. Arts, vol. 68, no. 3514, Mar. 26, 1920, pp. 300-307. Organization of work done by Training Department, Ministry of Labor, England, in connection with vocational education of disabled soldiers.

VOLCANIC TUFA

See TUFA.

VOLCANOES

Kloet Eruption. The Kloet Disaster (De Kloetramp), G. L. L. Kemmerling. Ingenieur, vol. 34, no. 44, Nov. 1, 1919, pp. 804-813, 7 figs. Details of eruption of mount Kloet on May 20, 1919, which completely destroyed Blitar. Paper read before Koninklijk Instituut van Ingenieurs and the Kon. Natuurkundige Vereeniging.

[See also LAVA.]

VOLTAGE REGULATION

See ELECTRIC CIRCUITS, A. C., Voltage Regulation.

VOLTAGE SYSTEMS

Constant, Advantages of. Constant and Variable Voltage Systems, A. M. Bennett. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 548-550, 2 figs. It is pointed out that any number of workers can operate in multiple from same machine up to its capacity when constant voltage system is used. Paper read before Am. Iron & Steel Elec. Engrs.

VOLTAGES

High. See HIGH VOLTAGES.

Standard. Standard Voltages (Normalspannungen). Elektrochemische Zeitschrift, vol. 26, no. 8-9, Nov.-Dec. 1919, pp. 91-94. Table of standards for the working voltage of electric plants of over 100 volts, adopted by the Assn. of German Electrotechnical Engrs.

Standards. See STANDARDS, Voltages.

VOLTAMETERS

Richards. The Richards Form Silver Voltameters, Juichi Obata. Researches of Electrotechnical Laboratory, Dept. of Communications, Tokyo, Japan, no. 76, May 1919, 21 pp., 4 figs. Richards cup form using least permeable porous cup as septum was compared with Smith form, which latter, it is said, gave a heavier deposit (about two parts in 100,000). This difference is attributed to effect of anode liquid and not electrostenolysis.

VOLTMETERS

Amplifying Direct-Reading. Direct-Reading Amplifying Voltmeter (Voltmètre amplificateur a lecture direct), MM. Abraham, E. Block and L. Block. Bulletin de la société française des Électriciens, vol. 10, no. 85, Jan. 1920, pp. 9-24, 4 figs. Alternating current is first amplified and subsequently rectified by detector valve. It then passes through milliamperemeter which gives voltage reading in specially constructed scale.

Corona. The Corona Voltmeter and the Electric Strength of Air, J. B. Whitehead and T. Isshiki. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 5, May 1920, pp. 441-444 and 511-526, 16 figs. The corona voltmeter is proposed as a natural secondary standard of high voltages. Its advantages as a standard, and its practical operation are described.

[See also AMMETERS.]

VOLTOL

See LUBRICATING OILS, Voltol.

VORTICES

See FLOW OF FLUIDS, Stream-line Flow.

VULCANIZATION

See RUBBER, Vulcanization.

W

WAGES

Bonus Systems. See BONUS SYSTEMS.

France. Excess Wages Paid to Heads of Families (Le sursalaire familial), Paul Razous. Génie Civil, vol. 76, no. 21, May 22, 1920, pp. 475-477. Practices of French companies. One company, for example, gives excess wages of 240 francs a year to employees having one child, 600 francs a year for two children, and 600 francs a year for each child above two.

German Mechanics. The Cost of Labor in Germany. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1197-1198. Tables showing minimum wages paid to mechanics in different parts of Germany according to recent wage agreements.

Hours of Labor and. Wages and Hours of Labor. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 82-115. Tables presenting a summary report on industries, including manufacture of machinery, machine tools, and typewriters, automobiles, cars, electrical apparatus and foundry industry. Wages and hours of labor in anthracite and bituminous coal mines, rise of wages in British industries, etc.

Incentive of. The Incentive to Work, J. E. Brown. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 647-648. It is said that while "various profit-sharing schemes may have proved effective in particular cases, as a general rule they are futile" because they involve deferred payments; it is therefore concluded that "a good weekly wage is one of the chief inducements to work."

Increase with Cost of Living. Keeping Workers Contented with Two-Pay Envelopes, Frank C. Hudson. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, p. 249. Plan which automatically takes care of advance or decline in cost of living based on Bradstreet's reports. It leaves basic wages as before and meets increased costs of living by special payments.

Minimum. Minimum Quantity Budget Necessary to Maintain a Worker's Family of Five in Health and Decency. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 1-18. Prepared by Bur. of Labor Statistics.

Overtime Rates. Practice Regarding the Payment of Punitive Overtime Rates, Leifur Magnusson. Monthly Labor Rev., vol. 10, no. 3, Mar. 1920, pp. 109-117. Overtime rates established by legislatures of various States are quoted, and also overtime rulings of National War Labor Board. Attention is directed to opinion expressed in a bulletin issued by War Department during the war, in which it was stated that theory under which "time and a half" was paid for overtime was "tacit recognition that it is usually unnecessary and always undesirable to have overtime."

Payment by Results. Organization by Payment of Results, J. E. Powell. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 756-757. Writer contends that exaggerated ideas as to possibilities of payment by results held the field; that inefficient output was largely due to faulty organization and could be remedied by good management without aid of payment by results at all; that payment by results should be treated as a stimulant to production, not as substitute for inefficient works organization. Summary of three lectures delivered under auspices of newly-founded Inst. of Indus. Administration.

Payment, Systems of. A Wage System, A. B. Rich. Bul. of Taylor Soc., vol. 5, no. 4, Aug. 1920, pp. 138-139. Payment plan in use at Dennison Mfg. Co., Framingham, Mass.

Systems of Paying Wages (Étude sur les salaires), Ch. Beun. Outillage, vol. 168, no. 32, Aug. 12, 1920, pp. 490-492, 6 figs. Formulæ for determining wages in the various systems. Comparison of systems.

Wage Payment Administration and Its Relation to Production Control, Paul Faltin and Leon Blog. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 139-142, 2 figs. Piece-work method of payment is advocated as more efficient than day-work method. It is urged, however, that in computing rate difference should be recognized between cases where output is primarily controlled by machines and cases where it depends almost wholly upon human element. Examples are given.

Wage Payment Systems in Machine Shops. Machy. (Lond.), vol. 16, no. 412, Aug. 19, 1920, pp. 621-623. Review of methods of wage payment generally used in machine-building plants, outlining advantages and disadvantages of each.

Wage Payment, A. L. DeLeeuw. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 939-940 and 976. After discussing present systems of payment and meaning of such terms as "capital, labor, right to organize, collecting bargaining and wage," writer states that in his opinion real cause of present-day unrest lies in fact that wage system in use is not based on knowledge and justice, but only on guesswork and on fear felt by both employer and employe that one may "do" the other.

Production Basis for. The Human Element in Production, A. F. Knobloch. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 137-139. Writer believes that workman must be paid in the ratio of production secured from him, and that without endangering his future. Describes how one plant has solved the problem.

Systems, Comparison of. Comparison of Wage Incentive Systems and the 100 Per Cent Time Premium, L. V. Estes. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 210-217, 3 figs. Exposition of 100 per cent time premium wage system developed and applied by writer.

Wages and Bonus Systems, H. C. Armitage. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 649-651. Comparative study of day-work, profit-sharing and co-partnership systems.

Unit Basis for. Earnings versus Wages, Dudley R. Kennedy. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 465-469. Starting from crying need for production of more goods writer states his belief that only method that promises success is adoption of system for paying earnings upon unit basis.

U. S. Government's Policy. The Government's Wage Policy During the Last Quarter Century, Mary Conyngton. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 19-35, 2 figs. Gives tables based on figures furnished to Commission on Reclassification by various bureaus, divisions and groups concerned, and used by Commission as a basis of a series of charts prepared under direction of Bur. of Education.

Woodworking Industry. Wages and Hours of Labor in Woodworking Industries. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 118-141. Statistics compiled by Bur. of Labor. Industries included are manufacture of lumber, planing-mill products and furniture.

WALLS

Brick, Economical Construction of. Economical Brick Construction in Spite of High Costs and Shortage of Building Material (Wirtschaftliche

Ziegelbauweise trotz Teuerung und Baustoffnot), H. Natho. Tonindustrie-Zeitung, vol. 44, no. 21, Feb. 17, 1920, pp. 189-191, 6 figs. Brick hollow wall called Tauber wall after inventor, which is made up of ordinary bricks with application of a simple, practical bond, and elimination of iron, wood, concrete or other costly building materials.

Building, Heat Transmission Through. See HEAT TRANSMISSION, Building Walls.

Concrete, Heat Transmission Through. The Stability of Thin Walls, and Heat Transmission Through Thin Walls. Concrete and Constructional Eng., vol. 15, no. 8, Aug. 1920, pp. 530-532. Advanced publication of report of Building Materials Research Committee under Dept. of Sci. Indus. Research. Tests showed that concrete walls as thin as 2⅝ in. can safely be used for partitions in cottage building, even when supporting joists. Of walls tested, rough ballast concrete offered least resistance and 10-in. concrete cavity unventilated wall with inner partition of coke breeze offered greatest resistance to flow of heat.

Gunite Construction for. New System of Gunite Building Wall Construction. Eng. & Contracting, vol. 53, no. 21, May 26, 1920, pp. 592-594, 7 figs. Description of method of house construction by means of the cement gun, developed by Traylor-Dewey Contracting Co., Allentown, Pa., which, it is said, minimizes use of skilled workmen and more costly building material.

Heat Insulation of. A Simple and Practical Method for Determining the Heat Insulation of Different Types of Building Construction (Ein einfaches, praktisches Verfahren zur Bestimmung des Wärmeschutzes verschiedener Bauweisen), Karl Hencky. Zeitschrift für die gesamte Kälte-Industrie, vol. 26, no. 11, Nov. 1919, pp. 85-88, 3 figs. Method of determining heat permeability of walls which, it is claimed, is especially adapted to testing walls of finished houses.

Heat Transmission Through. Heat Transmission Through Thin Walls. Contract Rec., vol. 34, no. 37, Sept. 15, 1920, p. 879. Data developed by Building Material Research Committee (British) and contained in recent report.

See also HOUSES, Heat Permeability of.

Hollow-Block. The Insulating Value of Hollow-Block Walls (Die Mauerstärken von Hohlsteinmauern), Fritz Emperger. Beton u. Eisen, vol. 19, nos. 1 and 2-3, Jan. 8 and Feb. 4, 1920, pp. 5-6 and 25-26, 10 figs. Comparison of five different forms which can be selected for hollow-block construction in order to lengthen route traversed by heat and dampness in passing through the wall.

Hollow-Brick Masonry Construction. The Schnell Construction System (Bauweise "Schnell"). Beton u. Eisen, vol. 19, nos. 11 and 12-13, July 5 and Aug. 5, 1920, pp. 118-120 and 138-141, 9 figs. Results of strength and heat-transmission test of a wall constructed according to the Schnell system (known in Germany as the Ambi-Massive construction system), carried out at the Material Testing Station of Vienna High School and demonstrating the superiority of this over other tested hollow brick masonry types.

Hollow Interlocking. The Sawyer Wall System. Contract Rec., vol. 34, no. 24, June 16, 1920, pp. 589-590, 6 figs. Description of a new hollow wall construction, built without use of wooden forms and consisting of two units, the main slab and locking (or key) slab, which are both shaped so that each dovetails into the other, in such manner, when placed in wall, that interlocking part of slabs forms space which is poured with grout (concrete) and locks wall together.

Retaining. See RETAINING WALLS.

Sea. See SEA WALLS.

WARFARE

Electricity in. See ELECTRICITY, APPLICATIONS OF, Warfare.

Submarine. See SUBMARINE WARFARE.

WARSHIPS

British. See H. M. S. Hood.

Conversion to Merchantmen. See SHIPS, Converted Warships.

Cruisers. The New Navy. Mar. Engr. & Naval Architect, vol. 42, no. 507, Dec. 1919, pp. 128-130, 3 figs., vol. 42, no. 512, May 1920, pp. 280-283, 2 figs. Dec. 1919: Principal features of light cruisers of "Caroline" class. May 1920: "Raleigh" class of light cruisers.

See also H. M. S. Hood.

Design. Future Battleships with Multiple Hulls (La futura nave da battaglia a carena multipla), S. Pherkas. Rivista Marittima, vol. 53, no. 6, June 1920, pp. 495-522, 7 figs. Examines desiderata in battleship of future, principal being steady gun platform, high margin of stability, and practical unsinkability.

The Design of War Vessels as Affected by the World War, David Watson Taylor. Jl. Franklin Inst., vol. 190, no. 2, Aug. 1920, pp. 157-185, 13 figs. It is estimated that present tendency is toward increased size and cost, but it is believed that this very tendency, under present financial, economic and political conditions in the world, may actually result in disappearance from future problems of these types, substitution for them of smaller and cheaper units being made possible by new developments in science and engineering.

Destroyers. An Application of the Method of Analyzing the Engineering Performance of Destroyers, Wentworth H. Osgood. U. S. Naval Inst. Proc., vol. 46, no. 8, Aug. 1920, pp. 1223-1249, 23 figs. Explains by means of definitions and specific examples elements which constitute analysis of engineering performance of destroyers. Suggestions for practical application of analysis aboard ship are given. Installations aboard U. S. S. Blakeley are taken as basis.

Geared Turbines for Torpedo Boat Destroyers. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 479-480, 2 figs. Arrangement of engine room in U. S. S. Clemson. Particulars of destroyer are: Displacement, 1200 tons; horsepower, 28,000; speed, 35 knots.

German. German Naval Construction, 1914-1918. Engr., vol. 129, nos. 3362 and 3365, June 4 and 25, 1920, pp. 570-571 and 642-644. From technical standpoint, light cruisers of war period exhibit no remarkable features. Geared turbines introduced for nearly every type of ship; capital ships and light cruisers equipped with two types of boilers, one type for solid and the other for liquid fuel. Particulars of German destroyers completed during the war.

H. M. S. Hood. British Battle Cruiser Hood, Eustace d'Eyncourt. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 492-495, 3 figs., partly on supp. plate.

H. M. S. Battle Cruiser "Hood." Eng., vol. 109, no. 2830, Mar. 26, 1920, pp. 397-399 and 414, 16 figs. partly on 4 supp. plates. Notable departure from existing types is "blister" surrounding main hull of ship as protection against effective attack by torpedo. Propelling machinery consists of four sets of Brown-Curtis turbines driving propeller shafting through single reduction gearing.

H. M. S. Hood, Eustace D'Eyncourt. Eng., vol. 109, no. 2830, Mar. 26, 1920, pp. 423-426, 3 figs. Principal data: Length between perpendiculars, 810 ft.; length overall, 860 ft.; breadth, extreme, 104 ft.; load draft, mean, 28 ft. 6 in.; displacement at load draught, 41,200 tons; speed at load draught, 31 knots; oil fuel capacity, 4000 tons.

H. M. S. "Hood," Eustace D'Eyncourt. Shipbuilding & Shipping Rec., vol. 15, no. 13, Mar. 25, 1920, pp. 400-404, 2 figs. Dimensions: Length between perpendiculars, 810 ft.; length overall, 860 ft.; breadth, extreme, 104 ft.; load draft, mean, 28 ft. 6 in.; shaft hp. of engines, 144,000; speed at load draft, 31 knots; oil fuel capacity, 4000 tons, armament, eight 15-in. B. L., twelve 5.5-in. B. L., four 4-in. H. A., two 21-in. T. T. submerged, 2 double 21-in. T. T. above water. Paper read before Instn. Naval Architects.

Reduction Gears. See REDUCTION GEARS, Warships; SHIP PROPULSION, Geared-Turbine.

U. S. S. Idaho. U. S. S. Idaho, Henderson B. Gregory. Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 99-133. Characteristics: Length between perpendiculars, 600 ft.; breadth, molded, 97 ft.; depth, molded, 46 ft. 3½ in.; draught, mean, 30 ft.; displacement, 32,000 tons; main battery, twelve 14-in. guns arranged in four three-gun turrets along center line of vessel; secondary battery, fourteen 5-in. rapid-fire guns for torpedo defence; torpedo equipment, four 6.8-meter by 21-in. submerged torpedo tubes; propelling machinery, Parsons turbines driving four lines of shafting; speed, 21 knots.

U. S. S. Tennessee. The United States Battleship Tennessee, James L. Bates. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 642-643 and 656, 1 fig. Vessel is 625 ft. long, has a beam of over 97 ft. and displaces 32,300 tons. Main battery consists of twelve 14-in. guns, and vessel has heavy belt of armor. Maximum speed is 21 knots. Vessel is electrically driven.

See also SHIP PROPULSION, Electric.

WASTE

Trade, Treatment of. Relation of Chemical Engineering to Sewage and Trade Waste Treatment, R. H. Eagles. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 438-440, 4 figs. Brief outline of methods of sewage and trade waste treatment. Activated-sludge process and chemical-engineering problem involved in pressing and drying sludge.

WASTE ELIMINATION

Industrial Opportunities for. Fields for Investigating Waste Elimination, A. Thau. Iron Age, vol. 105, no. 17, Apr. 22, 1920, pp. 1155-1157. Writer points out that there are a number of works which without their revenue being supplemented by substantial income from their by-product plants would financially be unable to exist, and tells how coke oven by-product recovery began. He adds notes on heat of discharged coke for steam making, putting incandescent coke into blast furnace, a coke-quenching machine in England, and utilizing carbon dioxide from chimneys in a German iron works.

WASTE HEAT

Mine Plants. Economy of Using Exhaust Steam from Winding Engines for Heating Purposes (Abdampfheizung als Dampfersparnis bei der Fördermaschine), A. Lütschen. Zeitschrift des deutscher Ingenieure, vol. 63, no. 39, Sept. 27, 1919, pp. 956-958, 11 figs. General discussion of utilization of heat of fuel in power plants, with particular reference to mine-haulage installations, and of means of obtaining, by employment of exhaust steam for heating purposes, a better utilization of heat and a reduction of costs.

Utilization. Exhaust-Steam Storage Plant with Utilization of Waste Heat for Low Pressure Steam Turbines (Abdampfspeicher mit Abhitzeverwertung für Niederdruck-Dampfturbinen), H. Schömburg. Wirtschaftsmotor, nos. 5-6, May-June 1920, pp. 21-22, 3 figs. Describes new type of heat-storage plant with double-pressure turbine, by use of which it is said to be possible to effect with a minimum of cost a drying and superheating of the exhaust steam.

Louisville Cement Company Leads in Waste Heat Utilization. Rock Products, vol. 22, no. 24, Nov. 22, 1919, pp. 36-41, 18 figs. Arranging coal-feeding hopper so as to avoid banking of pulverized coal in hopper.

The Generation of Steam Through Utilization of Waste-Steam Heat (Dampferzeugung durch Abwärmeverwertung), Ernst Blau. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 23 and 24, June 4 and 11, 1920, pp. 169-170 and 178-180, 6 figs. Refers to recent installations in a number of plants for utilization of waste heat which have given satisfactory service, and gives detailed description of the MAN waste-heat steam boilers with removable boiler-tube nests.

Waste-Heat Utilization in Steel Works (Abfallwirtschaft in Eisenbüttenwerken), H. Hermanns. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 1, Jan. 1920, pp. 6-14 and (discussion) pp. 14-16. Recommends a better utilization of the available fuels by extended use of waste fuels and of gas, which is all the more important because of recovery of low-temperature tar; economic utilization of energy content in exhaust gases, reserving high-grade gases for such heat processes where they can be most advantageously employed; utilizing waste heat from smelting, heating and annealing furnaces for generation of steam, waste heat from steam engines for heating purposes, utilization of natural heat of producer gas, and of clinker heat for generation of steam, etc.

WASTE MATERIALS

See CARS, Dump.

WASTE PREVENTION

Woodworking Plants. Controlling Wastes in Woodworking Plants, Carle M. Bigelow. Indus. Management, vol. 59, no. 5, May 1920, pp. 377-383, 7 figs. Methods and practice for utilizing large pieces of scrap, economical burning of chips, shavings and the like, and determining percentages of waste.

WASTE UTILIZATION

Tanneries. Studies on the Treatment and Disposal of Industrial Waste. The Purification of Tannery Wastes, Harry B. Hommon. U. S. Treasury Dept. Public Health Service, bul. No. 100, Nov. 1919, 133 pp., 5 figs. Experimental studies on purification of tannery wastes.

WASTES

Canning-Plant, Treatment of. Treatment of Canning-Plant Wastes in Wisconsin, E. J. Tully. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 1017-1018, 3 figs. Plans prepared by State Board of Health for treating plain washings, silage juice and combined wastes.

Municipal, Disposal of. Disposal of Municipal Wastes, Joseph Goder. Public Works, vol. 48, no. 19, May 22, 1920, pp. 444-446. Writer discusses several methods of disposal, giving his reasons for concluding that incineration is decidedly preferable for some classes of waste in all cases and for all classes in some cases. Interrelation of collection and local character-

istics of several classes of waste material with most desirable method of disposal is pointed out.

Municipal, Utilization of. The Utilization of Municipal Waste, William F. Morse. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 86-88. Utilization of sewage sludge, with particular reference to experience at Canton, Ohio.

WATER

Drinking, Fountains for. See DRINKING FOUNTAINS.

Filtered, Alumina in. Alumina Hydrate in Mechanically Filtered Water, Norman J. Howard and Frank Hannan. Can. Engr., vol. 38, no. 20, May 13, 1920, pp. 461-462. Observations on passage of colloidal alumina through water filtration plants. Research work at Toronto plant is said to indicate impossibility of removing residual alumina from filtered water.

Heat of Evaporation. Dependence of the Heat of Evaporation of Water on the Temperature (Ueber die Abhängigkeit der Verdampfundswärme des Wassers von der Temperatur), F. Henning. Zeitschrift für Physik, vol. 2, no. 2, 1920, pp. 197-200. In the sphere of low steam pressure a simple calculation can be used based on the difference between specific heat in the liquid and vapor states. Supplement to article by H. v. Steinwehr in same journal (vol. 1, pp. 333-336, 1920), including brief appendix by him.

Turbidity Standard. Turbidity Standard of Water Analysis, P. V. Wells. Sci. Papers, Bur. of Standards, no. 367, March 17, 1920, pp. 693-721, 4 figs. It is claimed that present standard of turbidity of water analysis is inaccurate, variations from average mounting in some cases to over 50 per cent. It is pointed out that this could be eliminated largely by having all these standards prepared by Bur. of Standards, without changing the specifications at all. If the standards were thus centrally prepared, it is noted, it would not be necessary to use platinum-wire for regulating size of particles.

WATER CONDUITS

See CONDUITS, Construction.

WATER FILTRATION

Bacterial Removal, Efficiency in. The Operation of an American or Rapid Water Filtration Plant for Twenty Years at York, Pa., James M. Caird. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 368-376. Attention is called to data which show that filtrates removed 98.7 per cent of bacterial.

Detroit Plant. Detroit's New 350-Million Gallon Filtration Plant, Theodore A. Leisen. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1194-1196, 2 figs. Old open reservoir to be covered for filtered water. Short mixing chamber. Steel roof over coagulation basin.

Drifting-Sand Filters. Sandwashers for the Drifting-Sand Rapid Water Filter, William Gore. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1192-1194, 2 figs. Loss-of-head studies at Toronto plant.

See also Toronto Plant.

Dundas, Ont., Plant. Water Filtration Plant Built on Gravity Supply at Dundas, Ont., Built at Low Figure. Contract Rec., vol. 34, no. 48, Nov. 26, 1919, pp. 1092-1096, 8 figs. Capacity of plant is 700,000 gallons per day. It is said to have been erected at cost of $30,000.

Filter Nozzles. Testing Discharge of Sprinkling Filter Nozzles, W. Earle Weller. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 203-204, 3 figs. Tests made by Bur. of Eng. of City of Binghamton, N. Y.

Iron Removal. The Iron Removal Plant at Iowa State College, Ames, Iowa, Charles S. Nichols. Municipal and County Engineering, vol. 59, no. 1, July 1920, pp. 26-39, 11 figs. Large per cent of iron in early water supplies necessitated iron removal plant. Details of plant are given; total cost per million gallons is said to be $6.13 and cost per connection for filtration varies from $0.75 to $1.50 per year.

Mechanical. Investigations on the Presence of Alumina Hydrate in Mechanically Filtered Water, Norman J. Howard and Frank Hannan. Contract Rec., vol. 34, no. 20, May 19, 1920, pp. 454-455. Work was done at Toronto filtration plant laboratories. Occurrence of aluminum hydrate was noticed in all waters examined. Its presence in Toronto water, however, is believed to be devoid of any sanitary significance.

Rapid Sand Filtration Plants. Rapid Sand Filtration Plant at Hawkesbury, J. O. Meadows. Contract Rec., vol. 34, no. 3, Jan. 21, 1920, pp. 52-54, 5 figs. Plant consists of two Allis-Chalmers low lift centrifugal pumps, each having capacity of 750-gal. per minute against head of 30-ft., coagulation basin, two reinforced-concrete chemical solution tanks, each with capacity of 620-gal., and chemical feeding devices.

Testing-Station Results. Milwaukee Testing Station Results on Filtration of Water. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 257-259. Hydraulic pump has been found to make excellent coagulant mixer, slat underdrains are proven effective, but cost of ozone treatment has been found to be too high.

Toledo, Ohio, Plant. Collapse of Basin Wall and Roof at Toledo. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 537-539, 3 figs. Following rapid filling of sendimentation basin at Toledo, Ohio, water filtration plant 350-ft. length of concrete baffle wall, 12 in. thick collapsed, carrying with it 54 panels of concrete roof slab and 16 columns. Repair methods are explained.

Toronto Plant. Description, Operation and Purification Effected by Drifting Sand Filtration System in Toronto During 1918, Norman J. Howard. Jl. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 504-520 and (discussion) pp. 521-534. Capacity of plant is 60,000,000 gal. in 24 hr., but maximum rate of 72,000,000 gal. must be maintained for period of ten hours. Rate of filtration is 150,000,000 gal. per acre per day.

[See also WATER, Filtered, Alumina in.]

WATER GAS

Bituminous-Coal. Bituminous Coal Water Gas, C. E. Reese. Gas Age, vol. 45, no. 4, Feb. 25, 1920, pp. 169-173, 2 figs. Record yields obtained at plant of Union Gas & Electric Co., Bloomington, Ill.

Heating Value. Water-Gas Oil Efficiency on a B.T.U. Basis, R. C. Downing. Am. Gas. Assn. Monthly, vol. 1, nos. 11-12, Nov.-Dec. 1919, pp. 655-658, 2 figs. Curves designed to determine b.t.u. of gases of oils varying 20 per cent. or more in quality.

Plants. Gas Plant at Providence, Wm. Russell. Gas Industry, vol. 20, no. 8, Aug. 1920, pp. 201-206. Water-gas plant with capacity of 3,500,000 cu. ft. per 24 hr.

See also GAS WORKS, Water-Gas Plant.

Production. Addition of Water Gas to City Illuminating Gas (L'Introduction du gaz "a l'eau" dans le gas "de ville"), A. Grebel. Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 305-312, 12 figs. Economies resulting from adding water gas to city illuminating gas are pointed out

and various processes of manufacturing water gas are described, notably Dellwik-Fleischer and Humphreys-Glasgow.

WATER HAMMER

Conduits, Calculation of. Study of Water Hammer in Metallic Conduits Under Pressure (L'étude des coups de bélier dans les canalisations métalliques sous pression). Houille Blanche, vol. 19, nos. 37-38, Jan.-Feb. 1920, pp. 6-12, 17 figs. Account of experimental research conducted to determine amplitude of uneven harmonics.

Water Hammer in Conduits Consisting of Two or Three Sections of Different Diameters (Calcul du coup de bélier maximum dans les conduites formées de deux ou de trois troncons de diamètres différents), Ed. Carey. Revue générale de l'Électricité, vol. 6, nos. 17 and 23, Oct. 25 and Dec. 6, 1919, pp. 539-551 and 787-801, 22 figs. Also in Bulletin Technique de la Suisse Romande, vol. 45, no. 23, Nov. 15, 1919, pp. 243-246, 2 figs.; vol. 46, nos. 1-13, pp. 5-7, 145-149, Jan. 10-June 26, 1920, illustrated. Simplification by means of graphs of formulæ developed by M. de Sparre and application of formulæ to conduits consisting of three sections.

See also CONDUITS, Air Chambers in.

Conduits Under Pressure. Water Hammer in Conduits Under Pressure and How to Take It into Consideration in the Design of Hydroelectric Installations (Les coups de bélier dans les conduites forcées et les moyens de les combattre dans les usines hydro-électriques), A. Causse. Génie Civil, vol. 76, no. 2, Jan. 10, 1920, pp. 35-39, 7 figs. Theory explaining mass oscillations originated in consequence of sudden closing of gates. Description of Bouchayer-Viallet's regulator and Bouvier's safety valve.

Water Hammer in Metallic Conduits Under Pressure (L'étude des coups de bélier dans les canalisations métalliques sous pression). C. Camichel. Houille Blanche, vol. 19, nos. 39-40, March-April 1920, pp. 53-57, 14 figs. Amplitude of odd harmonics.

Laws of Pressure Drop. Laws of Pressure Drop Resulting in Conduits from the Sudden Shutting of Gates (Les lois de fermeture rapide deduites des abaques de M. Allievi), D. Gaden. Revue générale de l'Électricité, vol. 7, nos. 3 and 4, Jan. 17 and 24, 1920, pp. 75-89 and 115-121, 17 figs. Based on theory of water hammer developed by L. Allievi in Teoria del Colpo d'Ariete, published in Atti del Collegio regli Ingegneri el Architetti, Milan, Italy.

Pipes. See Conduits.

WATER HEATERS

Electric. A Simple Electric Water Heater for the Utilization of Surplus Hydro-Electric Power, H. A. Winne. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp. 1030-1034, 3 figs. Scheme described consists of length of iron pipe, through which water to be heated flows, and through walls of which electric current is passed.

WATER MAINS

Cleaning. Water Main Cleaning in St. Louis, Mo., Edward E. Wall. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 249-252, 2 figs. Mechanical cleaner used for street water mains.

Concrete. Cumberland's Concrete Water Supply Main. Public Works, vol. 49, no. 3, July 17, 1920, pp. 47-50, 7 figs. More than a mile of 3-ft. pipe shipped 300 mi. by railroad and laid in inaccessible crooked trench on the mountainside. Method of manufacture in yard. Special flexible joints tight under 70-ft. pressure head. Method of calking joints without impact. Behavior of joints under combined pressure and deflection test.

Jointing Compounds. The Efficiency of Pipe Jointing Compounds as Compared with Lead, Fred O. Stevens. N. E. Water Works Assn. Jl., vol. 34, no. 2, June 1920 pp. 102-104 and (discussion) 105-113. Writer urges that waterworks managers and engineers try out the value of substitutes. Gives tests to show satisfactory use of several compounds.

Laying Under Water. Flexible Joints and Methods of Laying Subaqueous Water Mains. Eng. & Contracting, vol. 53, no. 23, June 9, 1920, pp. 649-651, 6 figs. Account of three papers presented before New York section of Am. Water Works Assn., dealing with laying a 12-in. main to North Brother Island, construction of the Narrows siphon from Brooklyn to Staten Island, and construction of two lines of 30-in. flexible joint subaqueous pipe under Hackensack River, N. J.

Leakage Detection. Detection of Leaks in Underground Pipes, H. E. Babbitt. Fire & Water Eng., vol. 67, no. 21, May 26, 1920, pp. 1082-1083 and 1088, 5 figs. Description of methods of detection and notes on use of sounding rod, aquaphone, leak locator and pulsograph. Water hammer and hydraulic gradient characteristics said to be helpful.

See also GEOPHONES, Uses.

Lowering While in Operation. 48-Inch Mains Lowered While in Operation, William M. Crowe. Fire & Water Eng., vol. 67, no. 12, Mar. 24, 1920, pp. 627-629 and 643, 9 figs. Work is said to have been performed successfully through solid rock by Philadelphia Bureau of Water, in which weight of mains was utilized in lowering them by gravity and downward motion was controlled.

Welding. See OXY-ACETYLENE WELDING, Pipe Mains.

[See also HYDRANTS.]

WATER METERS

Pumpage Reduction Through. Flat Rate Versus Meters, C. E. Abbott. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 132-136. Experience of plant is quoted as having shown that introduction of meter basis increased general efficiency, cut down amount of water pumped and amount of fuel consumed, and decreased operating expenses.

Railway Water Service. Report of Committee XIII—On Water Service. Bul. Am. Ry. Eng. Assn., vol. 21, no. 220, Oct. 1919, pp. 65-97, 6 figs. Report includes recommendations in regard to water meters considered as suitable for railroad water service and methods for testing and reading meters, and specifications for wooden water tank of 50,000-gal. capacity.

WATER MOTORS

Use of. Power from Town Water-Mains, E. Parry. New Zealand Jl. of Science and Technology, vol. 2, no. 6, Dec. 1919, pp. 377-382, 1 fig. Equations and drafts are presented which establish that power for industrial purposes cannot be economically provided through long pipes, and that both economy and good regulation demand shortest possible length of pipe consistent with head.

WATER PIPES

Laying in Frozen Ground. Laying a Pipe Line in Frozen Ground, William M. Elmer. Eng. & Min. Jl., vol. 108, no. 20, Nov. 22 and 29, 1919, pp. 823-824. Details of method used in British Columbia, where deep snows and 45 per cent grade were encountered.

Leaks. Leaky Cross-Connection Located by Alkali Test, W. Mack Angus and Carl Francis. Eng. News-Rec., vol. 84, no. 25, June 17, 1920,

pp. 1187-1188. Method used in locating cross-connection between dual supplies.

Underground, Leakage from. See WATER MAINS, Leakage Detection.

WATER POLLUTION

Railway Shops. The Outbreak of Typhoid and Dysentery at the Chicago & Alton Shops at Bloomington, M. C. Sjoblom. Jl. Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 560-565 and (discussion) 565-568, 1 fig. Danger resulting from connections between two water supplies, one of which is questionable.

WATER POWER

Aare River, Switzerland. The Water Power Plant "Gosgen" on the Aare River (Die Wasserkraftanlage "Gosgen" an der Aare der A.-G. Electrizitätswerk Olten-Aarburg). Schweizerische Bauzeitung, vol. 75, nos. 2, 3 and 4, Jan. 10, 17 and 24, 1920, pp. 11-15, 23-24 and 37-40, 31 figs. Description of weir, weir sill and pillar; reference is made to fishway built in wall of left bank where great quantities of fish collect. Description and illustration of a roofed-in service bridge of reinforced concrete. Description of weir sluices and accompanying windlasses; schematic diagram is included.

British Columbia. Report on Water Powers of British Columbia. Can. Engr., vol. 37, no. 20, Nov. 13, 1919, pp. 461-465, 3 figs. Concerning water legislation, meteorological and topographical data, surveys and maps, stream flow data, bench marks, power sites, present and proposed developments, electrical inspection and bibliography. From report published under Commission of Conservation. Also in Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1053-1059.

California. Potential Water Power in California and Progress of the Power Industry in the West, Frank G. Baum. Pacific Service Mag., vol. 12, no. 2, July 1920, pp. 35-48, 11 figs. Railroads and power and transmission systems two great industries affecting efficiency of country. Writer believes problems can be better solved by private methods than in any other way.

Coal vs. See POWER, Coal vs. Hydraulic Power.

Development in U. S. Developing National Water Power. Jl. of Elec., vol. 44, no. 10, May 15, 1920, pp. 463-478, 22 figs. Situation in different parts of country described and suggestions made for future developments. Financial and legislative aid urged. Report of National Electric Light Association Water Power Development Committee.

Preliminary Power Permits Under Consideration. Elec. World, vol. 76, no. 9, Aug. 28, 1920, pp. 422-423, 1 fig. List of applications filed for preliminary water power permits under new water power act.

Water Power Development in the United States, Henry J. Pierce. Nat. Elec. Light Assn. Bulletin, vol. 7, no. 8, Sept. 1920, pp. 569-575, 3 figs. Total available potential horsepower is estimated at 61,678,000. Present development is about 6,000,000 hp. Power upon which development is expected to be begun under new water-power act amounts to 2,122,000 hp.

Developments, Financing. Financing Water-Power Developments, Hugh L. Cooper. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 645-647, 4 figs. Discusses cost of construction, return on investment, relation of estimates to actual cost, competition with steam power, dependability of service, ability to obtain labor, return during development.

Federal Act. Provisions of the Federal Water-Power Act. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 204-208. Abstract of law creating federal power commission and permitting long-time use of water on government lands and navigable streams.

Halifax, N. S. Proposed Power Developments Near Halifax. Can. Engr., vol. 38, no. 15, Apr. 8, 1920, pp. 351-353, 4 figs. Development of Northeast and Indian rivers at cost of $1,050,000 to provide 10,500 hp.

Niagara Falls. Power Development at Niagara Falls. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 660-661. Economic importance of Niagara Falls in development of electrochemical industries of New York State.

Pacific Coast. Waterpowers of the Pacific Coast, F. F. Fowler. Gen. Meeting of Am. Electrochemical Soc., Apr. 9, 1920, paper no. 45, pp. 715-724. Feasible sites and prospective developments.

Permits and Licenses. Regulations Governing Water-Power Permits and Licenses. Elec. World, vol. 76, no. 12, Sept. 18, 1920, pp. 568-569. Regulations governing application for and granting of water-power permits and licenses under recently passed water-power bill formulated by Federal Power Commission.

Recent Utilization. Recent Utilization of Water-Power. Jl. Instn. Mech. Engrs., no. 2, Mar. 1920, pp. 129-151, 13 figs. Outstanding developments remarked are: Exclusive use of two types of turbines only, Francis reaction turbines for low and medium heads and Pelton impulse wheels for high heads; extension of use of Francis turbines under heads approaching 800 ft., and Pelton wheels in single stage up to 5500 ft.; exclusive adoption of balanced wicket gates for regulation of Francis turbines and circular nozzle with combined deflector and needle regulation for Pelton wheels. General increase of output per unit, maximum output at present being 31,200 b.hp.; and general increase of overall efficiency of about 6 to 10 per cent.

United States. Water Powers of the United States. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 654-659, 3 figs. Analysis of developed and undeveloped sources. Figure given for total potential water power is 59,360,000 hp., of which, it is said, only 9,823,540 hp. is developed.

Utilization of. Recent Advances in the Utilisation of Water Power, E. M. Bergstrom. Elecn., vol. 84, no. 2177, Feb. 6, 1920, pp. 139-141. Also in Jl. Instn. Mech. Engrs., nos. 1 and 2, Feb. and Mar. 1920, pp. 55-128, 129-151, and (discussion) 152-158, 51 figs.; Eng., vol. 109, no. 2822, no. 2823, no. 2824, Jan. 30, 1920, Feb. 6, 1920, Feb. 13, 1920, pp. 140-143, 191-197 and pp. 227-232, 50 figs. Development of utilization of water-power features, exclusive use of two types of turbines: Francis reaction turbines for low and medium heads and Pelton impulse wheel for high heads. Principal water-power installations in Europe and United States.

WATER PURIFICATION

Motor-Truck Units. Motor-Truck-Mounted Water Purification Units, Wm. J. Orchard. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 562-571, 7 figs. Arrangement and operation.

Smits Mechanical Purifier. The Smits Mechanical Water Purifier (Mechanische Wasserreiniger Bauart Smits). Zeitschrift für Transportwesen u. Strassenbau, vol. 36, no. 23, Aug. 10, 1919, pp. 272-274, 2 figs. Description of construction, operation and efficiency of an apparatus having a moving endless chain of separate filter

plates which can be repaired and cleaned at upper portion of the entrance.

[See also FILTRATION PLANTS; WATER TREATMENT.]

WATER RATES

Control of. The Control of Water Rates, Edward S. Walsh. Freight Handling & Terminal Eng., vol. 5, no. 10, Oct. 1919, pp. 383-388. Statement of Superintendent of Public Works, State of New York, in opposition to bill empowering Interstate Commerce Commission to control water front.

WATER SOFTENING

Clark Process. Notes on Water Softening, W. J. Sharwood. Pahasapa Quarterly, vol. 9, no. 3, April 1920, pp. 113-124, 2 figs. Kennicott apparatus for softening water by Clark process.

Hot Process. The Hot-Process Water Softener, George H. Gibson. Chem. & Metallurgical Eng., vol. 22, no. 19, May 12, 1920, pp. 899-902, 4 figs. Study of rate of sedimentation of lime and magnesia precipitates during softening at low and high temperatures. Plant equipment: reagent proportioner, tanks and filter.

Lime-Soda Ash Process. A Study of the Lime-Soda Ash Water-Softening Process, Max R. Herrle and Francis M. Gleeson. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 269-272, 3 figs. Observations on changes in alkalinity and hardness with addition of lime and soda ash separately and consecutively to hard water. Effects of insufficient, correct and excessive amounts of reagents.

[See also BOILER FEEDWATER, Softening.]

WATER SUPPLY

A. E. F. Water Supplies for the American Expeditionary Forces, Francis C. Longley. Jl. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 465-503. Activities of various sections of water-supply service.

Army. Keeping the First Army Supplied with Water, F. W. Scheidenhelm. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 623-628, 8 figs. Work of Water Supply Service. Its responsibility covered water for men, for animals, for railways, both standard and narrow gages, and for hospitals, including field and evacuation hospitals.

Army Camps. Notes on the Water Supplies of Army Camps, Cantonments and Posts in the United States, with Particular Reference to Problems of Quality, Charles Gilman Hyde and Charles A. Haskins. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 532-561. After reviewing circumstances and conditions which were obtained with respect to control of quality of water supplied to army camps, it appears to writers that variability in bacteriological quality observed with respect to considerable number of ground water supplies has shown that frequent examinations should be made of samples collected from different points in water-supply system.

Aviation Fields. Water Supply and Sewage Disposal at the Military Aviation Fields, Posts, Depots, etc., in the United States, Robert H. Craig. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 664-678. Experiences are quoted, such as for instance that Imhoff tanks with longitudinal flow, one flowing-through compartment over each sludge digestion chamber, settling compartment with steep sloping sides in less than 1:1 and with gas vent area from 20 to 25 per cent of total tank area gave best results.

Booster Station. Combined Gas and Motor-Driven Pressure Booster Station, A. E. Walden. Power, vol. 51, no. 24, June 15, 1920, pp. 950-952, 5 figs. Details of two pressure booster stations, consisting of combination gas-engine and motor-driven centrifugal pump units of 75 and 150-hp. capacity, each with pumping capacity of 2,000,000 gal. of water daily, at 55 ft. to 115 ft. and 231 ft. head respectively.

California. Water-Supply Problems and Projects in California, C. G. Gillespie. Eng. News-Rec., vol. 85, no. 10, Sept. 2, 1920, pp. 446-448. Comparative cost estimate of various types of water-works pumping equipment.

Camp McClellan, Ala. The Water Supply of Camp McClellan, Ala., Maurice R. Scharff. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 108-116, 2 figs. Specifications require system to be capable of delivering average of 1,020,000 gal. per day on any one day and maximum for one hour of 2.85 times average.

Catskill Aqueduct. History of Water Supply, J. C. Beardsley. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 25-42, 11 figs. Olden works contrasted with such modern undertakings as Catskill aqueduct.

Schoharie Development, Catskill Water Supply System for New York City, J. Waldo Smith. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 257-271, 4 figs. See also Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 639-653, 5 figs. Project involves impounding waters of Schoharie Creek in reservoir of 20 billion gal. capacity to be formed by construction of dam in Schoharie County, flow line of reservoir being at level of 1130 ft. above sea level.

Collecting Galleries. The Gallery Collecting System of the Des Moines Water Company, Des Moines, Iowa, A. T. Luce. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 475-485, 4 figs. Structural details of galleries.

Conduit Capacity and Storage. Estimation of Conduit Capacity in Relation to Storage, Frederic H. Hapgood. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 153-154, 1 fig. Calculations made in connection with studies for new water supply for New Britain, Conn. Problem was finding most economical combination of capacities of retarding reservoir and pipe line to provide sufficiently complete development of drainage area selected.

Des Moines, Ia. Des Moines Water Gallery Collecting System, A. T. Luce. Fire & Water Eng., vol. 67, no. 4, Jan. 28, 1920, pp. 203-207 and 221, 10 figs. It is said that Des Moines Water Co. is one of first to thoroughly develop water supply by means of infiltration galleries. Equipment in use for excavation of gallery is described and illustrated.

Groundwater Estimation. Hydrologic Preparatory Work and Quantity Determination in Connection with Groundwater Supplies (Ueber hydrologische Vorarbeiten und Mengenbestimmung bei Grundwasserversorgungen), O. Smreker. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 12, Mar. 20, 1920, pp. 282-283. Discussion of G. Thiem's article on Hydrologic Preparatory Work for the Ground-Water Supply of the City of Danzig. Writer claims that Thiem's deductive method for quantity determination is unreliable. A brief reply from Thiem is appended.

Quantitative Methods of Estimating Groundwater Supplies, Oscar E. Meinzer. Bul. Geol. Soc. of America, vol. 31, no. 2, June 1920, pp. 329-338. Describes four groups of methods, the intake, discharge, water-table and underflow methods, the first three of which, it is stated, are absolutely independent of one an-

other, and in many areas two, or even all three, can be applied, and in this way checks can be obtained on accuracy of work.

Groundwater Flow. See FLOW OF WATER, Groundwater.

Hetch Hetchy. See San Francisco.

Italy. See AQUEDUCTS, Aputian, Italy.

Metered Systems, Records of. Water Use Variation in Completely Metered Systems, Allen Hazen. Eng. News-Rec., vol. 85, no. 10, Sept. 2, 1920, pp. 449-450, 3 figs. Data from Springfield, Mass., Hartford, Conn., and Superior, Wis.

Metering. Effect of Metering on Water Consumption H. P. Matte. Jl. Western Soc. Engrs., vol. 24, no. 3, March 1919, pp. 133-148 and (discussion) pp. 148-152, 9 figs. Based on records taken at various cities both before and after installing meters.

Results of Completely Metering Omaha Water Supply, F. P. Larmon. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1186-1187. Average daily consumption per capita was 128 gal. in 1912. With introduction of meters then there came a decrease which continued until 1915, when average daily consumption per capita was 94 gal.

Montreal. The Municipal Water Supply of Montreal, T. W. Lesage. Can. Engr., vol. 38, no. 26, June 24, 1920, pp. 584-587, 1 fig. Water is sterilized by hypochlorite. Average daily consumption for 1919 was 65,046,000 imp. gal. Paper read before American Water Works Association.

New York City. Underground Water Waste Control in New York, H. T. Havill and F. B. Nelson. Fire & Water Eng., vol. 67, no. 22, June 2, 1920, pp. 1127-1129, 1 fig. Two papers read before New York section of Am. Water Works Assn., treating of same subject in practical way and complementing each other in account of work done in location and repair of leaks by New York department and methods pursued in work. Difficulties are said to be aggravated by subsurface congestion of pipes and conduits.

Newark, N. J., Metering of. Method of Metering the Water Supplied to the Five Distribution Systems of the City of Newark, N. J., George Sanzenbacher. Jl. Am. Water Works Assn., vol. 7, no. 2, Mar. 1920, pp. 163-170, 6 figs. Continuous automatic record of quantity of water supplied to each of five service districts is kept.

Old Hickory Works. The Water Supply of the Old Hickory Works, Oscar E. Bulkeley. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 427-438. System consists of two intake pumping stations, three large parallel wood-stave pipe lines about 1½ miles long, booster pump house, filtration plant, power house flume and twelve service pumps, and distribution systems. Approximately 100,000,000 gal. of raw water are required daily, of which 65,000,000 are filtered.

Practice, Progress in. Progress Shown in Water-Supply Practice. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 540-543. Abstracts of papers read before Thirty-ninth Annual Convention of New England Water Works Assn., Holyoke, Mass., Sept. 7-10, 1920. Titles of papers were: Instructions to Employees at Pumping Stations and Filter Plants, Dow R. Gwinn; The Management and Finances of the Holyoke Water-Works, Patrick J. Lucey; Office Methods and the Water Consumer, Reeves J. Newsom; Operation of a True Siphon on a Main Supply Pipe, Wallace R. Braun and Charles W. Sherman; Water-Works Service Pipes, D. A. Heffernan; Boating and Fishing in Water-Supply Ponds and Reservoirs, X. H. Goodnough; Quicksand: Its Nature, Behavior and Methods of Control, Charles R. Gow.

Pumping by Hydraulic Power. Pumping Croton Water by Hydraulic Power: Water Supply of New York, Winfred D. Hubbard. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 461-470, 2 figs. Only approximately 50 per cent of Croton has been in use because of low service. It is planned to use centrifugal pumps which would take Croton water from low-service mains and deliver it to intermediate service, which is much more in demand.

San Francisco. Hetch Hetchy Water Supply. Public Works, vol. 48, no. 10, Mar. 20, 1920, pp. 203-206, 6 figs. Features of 154-mile aqueduct and auxiliaries for ultimate delivery of 400,000,000 gallons daily to San Francisco at estimated cost of $45,000,000.

Shallow-Ground, Development of. Rational Method of Developing a Shallow Ground Water Supply, W. D. P. Warren. Municipal & County Eng., vol. 58, no. 5, May 1920, pp. 220-225, 1 fig. It is concluded that with a saturated water-bearing material located on a catchment area of proper extent a shallow-ground water supply will ordinarily be developed at far less expense than an impounded supply.

Snow-Field, Determination of. Determination of Water-Supply from Snow Fields. Eng. News-Rec., vol. 83, no. 17, Oct. 23, 1919, pp. 766-768, 1 fig. Snow sampler measurements and tables based on investigations made in Sierra Nevada Mountains.

Standardization. Index Numbers and Scoring of Water Supplies, Abel Wolman. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 444-456, 5 figs. Principles of water supply scoring, comparison of these methods with similar ones in index number making, discussion of their points of analogy and difference, and development of data as guides in problems of water-supply standardization.

Storage in Open Reservoirs. Sanitary Effect of Water Storage in Open Reservoirs, Abel Wolman and S. T. Powell. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 804-805, 2 figs. Studies of chemical and bacterial characteristics of water on entering and leaving two reservoirs in Maryland.

Submerged Pipe Line. Repairs to Twelve-Inch Submerged Pipe Line, Patrick Quilty. Fire & Water Eng., vol. 67, no. 16, April 21, 1920, pp. 831-833 and p. 847, 5 figs. Installation of and subsequent repairs to main supplying North Brother Island, New York City.

Tulsa, Okla. The Water Supply of Tulsa, H. N. Roberts. Public Works, vol. 48, no. 18, May 15, 1920, pp. 413-416, 5 figs. Filtration is employed, dry chemical feed being used.

Turbine Pumps. Application of Turbine Pumps to Water Supply. Elec. Times, vol. 58, no. 1503, Aug. 5, 1920, pp. 108-109, 3 figs. Comparative study of various prime movers for driving turbine pumps. Paper read before Instn. of Water Engrs.

Underground Waste Control. See New York City.

Waste Prevention. Philadelphia Fights Water Waste. Fire and Water Eng., vol. 66, no. 15-18, Oct. 1919, pp. 837-841, 8 figs. Charts showing pitot records obtained.

Reduction of Water Consumption by Means of Pitometer Survey and Constant Inspection, George C. Andrews. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 355-370, 8 figs. Experience of Buffalo Bur. of Water.

Some Details of Water-Waste Prevention Surveys, Paul Lanham. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 287-300 and (discussion) pp. 300-305, 7 figs., partly on supp. plate. Concerning proper

division of mains into permanent districts, making and studying flow charts taken upon various districts, and organizing properly balanced force for handling water-waste problem.

Watershed Leakage. Watershed Leakage in Relation to Gravity Water Supplies, Robert E. Horton. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 306-332 and (discussion) pp. 333-336, 11 figs. Also in Can. Engr., vol. 38, no. 6, Feb. 5, 1920, pp. 195-198, 6 figs. Suggestions for investigating likelihood of watershed leakage based on examination of conditions in various plains in New York State.

Winnipeg, Man. See CONDUITS, Reinforced-Concrete.

[See also HYDRANTS.]

WATER TANKS

Concrete. Concrete Water Tank on the Western Railway of Havana, John P. Risque. Ry. Maintenance Engr., vol. 16, no. 2, Feb. 1920, 3 figs. Five 50,000-gal. tanks said to have been erected at cost of 27½ cents per gal. of capacity and to have given uniformly good service with material reduction in amount of painting required. Details of construction are given.

Reinforced Concrete in Chile. Concrete & Constructional Eng., vol. 15, no. 4, April 1920, pp. 227-233, 3 figs. Details of reinforced-concrete water tank of 15,000 metric tons capacity.

WATER TOWERS

Reinforced-Concrete. Concrete in Water Works Construction, A. C. Irwin. Jl. Am. Water Works Assn., vol. 7, no. 2, Mar. 1920, pp. 203-211, 1 fig. Examples are illustrated of reinforced-concrete water tower and chimney.

[See also COAL BUNKERS, Reinforced Concrete.]

WATER TREATMENT

Chlorination. Chlorination as a Means of Disinfecting Municipal Water Supplies, G. G. Nasmith. Contract Rev., vol. 34, no. 23, June 9, 1920, pp. 532-537. Advantages of method with notes on amounts of chlorine required by different waters.

Field Methods for the Chlorination of Small Amounts of Water, F. R. Georgia. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 654-663, 1 fig. Chlorination was carried out in Lyster bags. Details of system used for effecting continuous purification of water as it was pumped.

The Chloramine Process as Applied to the Catskill (Esopus) Water, Frank E. Hale. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 804-817 and (discussion) pp. 818-822, 3 figs. Concerning reported discovery of dead trout and other fish in Esopus Creek after treatment of water was started with 0.4 p.p.m. chlorine.

The Effect of Chlorine on Periodic Precipitation, A. W. Foster. Jl. Phys. Chem., vol. 23, no. 9, Dec. 1919, pp. 645-655, 9 figs. Results obtained by using chlorinated tap water instead of distilled water in experiments on absorption of ions by colloids.

Clay and Silica Removal. The Removal of Clay and Silica From Water, Otto M. Smith. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 302-314, 10 figs. List of electrolytes is given arranged in the order of their efficiencies as coagulants, and results of tests with these electrolytes are presented in diagrammatic forms.

Filtration. See WATER FILTRATION.

Iron Removal. Plants for the Removal of Iron from Water (Wasser-Enteisenungsanlagen). Kraft und Betrieb, vol. 3, no. 15, Nov. 1, 1919, pp. 164-167, 3 figs. Notes on design, construction and operation of open and enclosed plants, and description and illustration of a large settling tank of reinforced concrete.

Ozonization. Ozone as a Disinfectant in Water Purification, Joseph W. Ellms. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 60-64. Also Fire & Water Eng., vol. 67, no. 3, Jan. 21, 1920, pp. 147-148. It is pointed out that ozone used as disinfecting agent is "no more a cure-all for a polluted water supply than are other disinfecting agents that are at present more widely employed," and that it cannot be denied "that the process needs investigation and scientific development in order to make it economically efficient."

Ozonizing Plant. Swimming Pool of the West Point Military Academy. Am. Architect, vol. 116, no. 2293, Dec. 3, 1919, pp. 701-705, 5 figs. Layout and features of ozone water purifying plant.

Rainfall and High Bacterial Count. An Inquiry Into the Effect of Meteorological Conditions Upon the Efficiency of Storage, Filtration and Chlorination, Based Upon a Study of the Hagerstown Water Supply, Abel Wolman. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 352-363. Fundamental cause producing excessive bacteria counts in tap water was found to be excessive rainfall.

St. Louis. Water-Treatment at St. Louis, Mo., Edward E. Wall. Am. Jl. Public Health, vol. 10, no. 5, May 1920, pp. 437-443. Outline of methods, the success of which are evidenced by low mortality rates of the city. Paper read before Sanitary Eng. Section, Am. Public Health Assn.

Softening. See WATER SOFTENING.

Ultra-Violet Ray Sterilization. Elements of the Theory Underlying the Disinfection of Water by Ultra Violet Light, Gordon M. Fair. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 325-342, 3 figs. Bibliography of ultra-violet light is included.

Water for Shipyard Drinking Fountains Treated by Violet Rays, Walter L. Decker. Eng. News-Rec., vol. 84, no. 12, March 18, 1920, pp. 572-573, 2 figs. System consists of one 60-in. quartz filter, two 30-in. bone-black filters, which are connected in parallel to take water after passing quartz filter, then two ultra-violet-ray sterilizers connected in series for final treatment of water after passing charcoal filters.

WATER WASTE

See WATER SUPPLY, Waste Prevention.

WATER WHEELS

See CURRENT MOTORS.

WATER WORKS

Accounting Methods. See ACCOUNTING, Water-Works.

Akron, Ohio. Water Works Improvements at Akron, Ohio, G. Gale Dixon. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 315-324, 7 figs. Outlines plans for increasing capacity from present maximum capacity of 25,000,000 gal. daily to 52,000,000 gal.

Appliances, Standardization of. Standardization of Water Works Appliances, Adolph Mueller. Contract Rec., vol. 34, no. 28, July 14, 1920, pp. 668-669. As an example of unnecessary number of appliances, it is stated that 128 cities use 332 styles of corporation cocks where three patterns in seven sizes would answer.

Chicago. Plan of Chicago's Improved Water System—1920-1955, P. S. Combs. Eng. World, vol. 16, nos. 6 and 7, April and May, 1920, pp. 317-325 and 379-387, 11 figs. Report of city engineers on status of pumping station with recommendations for improvements and extension. Intakes in Lake Michigan.

Denver. Denver's Water Plant. Universal Engr., vol. 31, no. 3, Mar. 1920, pp. 24-26, 7 figs. Growth and development of water plant is reviewed. Dam is 236 ft. high, 176 ft. thick at bottom and 18 ft. thick at top. Basin holds 6,400,000,000 gallons of water.

Depreciation. Practical Checks upon Water-Works Depreciation Estimates, Leonard Metcalf. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 371-393. Records of actual depreciation developed in practical administration of water works in different parts of United States. Necessity for keeping better records of plant abandoned as evidence of actual in contra-distinction to theoretical depreciation.

Electrically Driven. The Application of Electric Motive Power to Small Waterworks Plants in Indiana, D. D. Ewing, and G. C. Blalock. Purdue University, Publications of Eng. Departments, vol. 3, no. 3, Dec. 1919, 100 pp., 47 figs. Survey of plants. Electrically driven pumps, it is said, have proven highly satisfactory. It is added that no troubles were found which were directly chargeable to mode of operation. It is also mentioned that first cost of an electrically operated pumping plant is from 25 to 50 per cent of that of a steam pumping plant. Bibliography on electrification of pumping station is appended.

Flint, Mich. Flint Water Filter Improvements and Reconstruction. Eng. News-Rec., vol. 84, no. 25, June 17, 1920, pp. 1189-1191, 6 figs. New construction consists of two settling basins of 2,250,000 gal. capacity each; baffled mixing chamber; eight additional filter units of 1,000,000 gal. capacity each; head house and chemical storage building; laboratory; chemical feeding devices; and intake and suction well.

Motor-Driven Pumps. See PUMPS, CENTRIFUGAL, Motor-Driven.

Public Control. The Effect of the War Period 1914-1918, and Public Control Upon the Water Works of the United States, Leonard Metcalf. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 785-803, 5 figs. Review of 500 decisions, more or less effecting water works, handed down by courts and commissions during period of four years and one-half from Jan. 1915 to May 1919.

Pumping-Plant Costs. See WATER SUPPLY, California.

Pumping Stations. See PUMPING STATIONS.

Pumps. See PUMPS, CENTRIFUGAL, Water Works.

Toronto. Growth of New Toronto Waterworks System from Village Supply to Large Plant, E. M. Proctor. Contract Rec., vol. 34, no. 23, June 9, 1920, pp. 518-522, 12 figs. Present average daily pumpage is 2,500,000 gal.

Valuation. Prewar and Present Reproduction Costs of Water Works, L. R. Howson. Jl. Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 523-527. Reproduction costs must be considered in valuation of water works.

Winnipeg, Can. Designing Aqueduct of Winnipeg Water Works, James H. Fuertes. Public Works, vol. 49, nos. 12 and 13, Sept. 18 and 25, 1920, pp. 257-259 and 279-281, 8 figs. Notes on types of inverts used, after testing different types to destruction, and after constructing part of line; effect of alkali soil; protecting concrete from alkali; designing and constructing overflows, blow-offs, culverts and miscellaneous small works.

WATERPROOFING

Improvements. Suggested Improvements in Waterproofing Railroad Structures. Eng. & Contracting, vol. 52, no. 25, Dec. 17, 1919, pp. 701-702. Such as having membrane come in ready-made sheets on work.

WATERWAYS

Great Lakes—Sea. Duluth to Liverpool in One Bottom, Robert G. Skerrett. Sci. Am., vol. 122, no. 25, June 19, 1920, pp. 670-686, 2 figs. Arguments in favor of a deep-water route between the Great Lakes and the sea.

The St. Lawrence River Project, Horace C. Gardner. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 509-512 and p. 527, 2 figs. Economical advantages of Great Lakes-Ocean waterways.

Inland. See INLAND WATERWAYS.

[See also CANALS; RIVERS.]

WATT-HOUR METERS

Calibration. Calibrating Standard Watt-Hour Meters, F. A. Kartak. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 740-742, 6 figs. Extreme accuracy in testing portable standard watt-hour meters by taking revolutions of meter during a definite time interval fixed by an electric clock; details of electrical apparatus which starts and stops meter.

Polyphase. Testing Polyphase Watt-Hour Meters, P. B. Findley. Power, vol. 51, no. 22, June 1, 1920, pp. 875-878, 9 figs. Comparison is made between single-phase and polyphase watt-hour meters. Detailed description is given of meters, and how to test and adjust polyphase type is explained.

WATTMETERS

Reactive Volt-Ampere Measurements. Reactive Volt-Ampere Indicators, H. C. Yeaton. Elec. World, vol. 75, no. 26, June 26, 1920, pp. 1476-1479, 10 figs. It is shown how standard indicating wattmeters may be applied to measurement of reactive volt-amperes by selecting suitable scales and making proper connections in circuit.

Thermal. The Thermal Storage Demand Wattmeter, Paul M. Lincoln. Elec. Jl., vol. 17, no. 6, June 1920, pp. 253-256, 6 figs. Schematic diagram of operation. Reference is made to article in Trans. Am. Inst. Elec. Engrs., vol. 37, p. 189, explaining principle of operation of thermal wattmeter.

Vibration Type. A Vibration Wattmeter (Ueber ein Vibrationswattmeter), J. Biermanns. Archiv für Elektrotechnik, vol. 9, no. 4, Aug. 8, 1920, pp. 182-190, 3 figs. Description and theory of vibration wattmeter. Recommends that current and voltage coils of instrument be constructed with close coupling so that disturbances can be avoided.

[See also AMMETERS.]

WAVE METERS

See RADIOTELEGRAPHY, Wavemeters.

WAVE MOTION

Mechanics of. Absolute Mechanics of Wave Motion and the Newtonian Relativity of Energy (Mécanique absolue des ondulations et Relativité newtonienne de l'Énergie), G. Sagnac. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 643-646. Their correlation in view of accepted theories of radiation and movement.

WAVE POWER

See WAVES, Power from.

WAVES

Deep-Sea. Determination of Mean Values for Forms of Diverging Deep Sea Waves Based on Observations Past and Present (Aufsuchung von Mittelwerten für die Formen ausgewachsener Meereswellen auf Grund alter und neuer Beobachtungen), Erich Zimmermann. Schiffbau, vol. 21, nos. 23 and 24, Apr. 28 and May 5, 1920, pp. 633-640 and 663-670, 20 figs. Results of investigations are shown in a single curve and all the trochoid waves on surface of the sea between 10 and 500 meters long can be deduced from the single wave illustrated. Results of author's observations in 1914 are presented in tabular form and their influence on ship construction is discussed. Bibliography is appended.

Electromagnetic. The Electromagnetic Compound Plane Wave (Die elektromagnetische Zweimittel-Planwelle), Karl Uller. Jahrbuch Zeitschrift für drahtlose Telegraphie u. Telephonie, vol. 15, no. 2, Feb. 1920, pp. 123-152. Writer claims to have discovered a new manner of wave propagation whose characteristics are not recognizable under existing hypotheses; he states that every cable current and every alternating current is a wave of this type, and that every spark discharge, atmospheric discharge, etc., emits such a wave.

Force of, Estimating. On a Method of Estimating the Force of Waves, I. Hiroi. Jl. College of Eng. Tokyo Imperial University, vol. 10, no. 1, June 30, 1919, pp. 1-19, 9 figs. partly on supp. plate. It is concluded from study of empirical formulæ and results of experiments that greatest intensity of wave pressure is found near water surface, acting on comparatively small area. It is believed that mean intensity of pressure on large area is hardly capable of direct measurement, and use of reliable formula is considered as only practical method for estimating probable mean wave pressure in any given locality.

Power from. An Experimental Determination and Utilization of Wave Power, I. Hiroi. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 1, June 30, 1919, pp. 21-36, 6 figs. partly on supp. plate. Describes apparatus for measuring wave power consisting of float board weighted with stones making large pendulum, which is allowed to swing freely under stroke of waves. Amplitude of motion of pendulum measured at each stroke gives amount of available energy. Apparatus is also described for compressing air in container by exposing grated opening of large pipe to alternate action of wave. Check valve between container and pipe permits accumulations of compressed air in container.

Stationary. Stationary Waves in Water, A. R. Richardson. Lond., Edinburgh and Dublin Philosophical Mag. & Jl. of Sci., vol. 40, no. 235, July 1920, pp. 97-110, 6 figs. Some exact solutions are obtained, and existing results are linked together through a differential equation. Discusses, among other problems, that of flow over a weir and approximate calculation is made of constants which appear in Francis formula. It is shown that although problem of liquid under gravity with a free surface and given form of rigid boundary is very difficult of solution, yet main characteristics can be determined by noting form of free surface in such cases and using methods described.

WEATHER

See METEOROLOGY.

WEIGHING MACHINES

Automatic. Automatic Weighing Machines, George Frederick Zimmer. Eng. & Indus. Management, vol. 3, no. 11, Mar. 11, 1920, pp. 341-344, 2 figs. Description of Avery's patent self-balancing device.

WEIGHTS AND MEASURES

Asiatic. Weights and Measures of the Far East. Trans-Pacific, vol. 1, no. 3, Nov. 1919, pp. 67-68. Units used in the various countries and their equivalents in English system.

[See also METRIC SYSTEM.]

WEIRS

Discharge Formula. Additional Experiments with Weirs (Weitere Versuche über Streichwehre), Hubert Engels. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 5, Jan. 31, 1920, pp. 101-106, 24 figs. Former tests of weirs in rectangular channels of unvarying cross-section are brought to conclusion by experiments with sharp-crested weirs in rectangular channels with contracting downstream. Results of experiments are given in tabular and diagrammatic form, from which a new discharge formula is derived. Report of the Dresden River-Construction Laboratory —II.

Flow Near. See FLOW OF WATER, Weirs.

[See also FLOW OF WATER, Weir for Measuring.]

WELDERS

Training. Training Arc Welders, O. H. Eschholz. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 750-752. Discussion of principles necessary for production of satisfactory welds. Definition of welding terms and bibliography of articles on welding in technical magazines.

WELDING

Acetylene. See OXY-ACETYLENE WELDING.

Aluminum. See ALUMINUM, Welding of.

Arc. See ELECTRIC WELDING, ARC.

Automobile Repair Work. Welding and Its Relation to the Repair Industry, Lord Campbell, Jr. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 42-46, 4 figs. Welding is classified into four general headings: Forging, oxy-acetylene or other gas processes, electric arc and thermit methods. Field of each one of these is pointed out with special reference to automobile repair work.

Boilers. Repairs to Boilers by Welding. Eng. & Indus. Management, vol. 4, no. 8, Aug. 19, 1920, pp. 234-235, 2 figs. Regulations enacted by Nat. Boiler & General Insurance Co., Ltd., Manchester for use and information of its inspectors and of firms insuring their machinery under company's policy. Rules refer to both electrical and gas welding.

Chrome Steel. See CHROME STEEL, Welding.

Disk-Depression Method. Disk-Depression Method of Welding, Chas. H. Kicklighter. Southern Engr., vol. 32, no. 4, Dec. 1919, pp. 66-68, 12 figs. It is claimed for this method that joint effected by it has greater strength than riveted joint and that greater economy in production is secured with it.

Electric. See ELECTRIC WELDING; ELECTRIC WELDING, ARC; ELECTRIC WELDING, RESISTANCE.

Electric, Arc. See ELECTRIC WELDING, ARC.

Electric, Resistance. See ELECTRIC WELDING, RESISTANCE.

Eye Protection. Eye Protection in Welding Operations, R. R. Butler. Eng., vol. 109, no.

2842, June 18, 1920, pp. 823-826, 7 figs. Reasons why protection is needed for the eye and properties of glasses for protecting eyes from injurious radiations. Paper read before British Acetylene & Welding Assn.

Fusion. See ELECTRIC WELDING, Drop Forgings; FUSION WELDING.

Gas. See OXY-ACETYLENE WELDING.

Gas Torch. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 52, no. 12, Mar. 18, 1920, pp. 603-609, 33 figs. Examples illustrating possibilities of gas torch as welding tool.

Iron Wire. Welded Line Joints Prove Their Efficiency, B. J. Schwendt. Ry. Signal Engr., vol. 13, no. 3, Mar. 1920, pp. 97-102, 13 figs. Various types of joints are illustrated and characteristics of each are discussed. Statistical data are presented in which comparative figures, based on tests made by Bureau of Standards, Washington, D. C., indicate electrical and mechanical properties of both welded and soldered galvanized iron line wire.

Jigs and Fixtures for. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 665-669, 13 figs. Welding jigs and fixtures used for repetition jobs.

Joints, Design of. Design of Welded Joints. Universal Engr., vol. 31, no. 1, Jan. 1920, pp. 36-38, 13 figs. Various types of metallic joints are sketched and method of welding each is indicated.

Locomotive Fireboxes. Methods of Welding Locomotive Fireboxes, George L. Walker and R. T. Peabody. Boiler Maker, vol. 20, no. 4, Apr. 1920, pp. 99-103, 37 figs. Discusses methods of restoring firebox edges by welding and offers suggestions for facilitating repairs.

Nomenclature. See WELDS, Joints.

Oxy-Acetylene. See OXY-ACETYLENE WELDING.

Ship Construction. Welding Mild Steel, H. M. Hobart. Welding Engr., vol. 4, no. 12, Dec. 1919, pp. 40-44 and 49-55. Investigations undertaken by Welding Research Sub-Committee of Welding Committee of Emergency Fleet Corporation. General object of investigations was to extend use of welding in construction of merchant ships and to provide definite basis for obtaining best economy and efficiency in employing welding in place of riveting in construction of hulls.

See also SHIPBUILDING, Forging and Welding.

Ships, German, Repair of. The Welding and Cutting Plant at Balboa, R. D. Gatewood. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1023-1025, 3 figs. Attention is directed to work done in connection with salvaging broken parts of main machinery and auxiliaries on five ex-German ships that had been badly damaged by their crews. Writer states that almost every conceivable part of ships was saved by either oxy-hydrogen or electric welding.

See also STEEL, High-Carbon, Welding.

Thermit. See THERMIT WELDING.

Welders, Training. See WELDERS, Training.

Welds. See WELDS.

WELDS

Joints. Welded Joints and a Nomenclature for Welding, William T. Bonner. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 95-96, 8 figs. Writer believes that electrically welded jointures, when properly made, are superior to every other method of connecting together the various parts of a ship; and that a very limited nomenclature will meet every requirement of intercommunication between drafting room and shop.

Oxy-Acetylene. See OXY-ACETYLENE WELDING, Characteristics of Welds.

Strength of. Effects of the Chemical Composition of Welding Electrodes, J. S. Orton. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 625-626, 2 figs. Results of test undertaken to determine effects of chemical composition of electrode on strength of weld.

Tests. Tests of Welded Materials, Maurice Y. Kapetansky. Michigan Technic, vol. 32, no. 3, Oct. 1919, pp. 201-213, 16 figs. Results of chemical, physical and microscopical tests are presented and their relative importance in determining value of welds is discussed. Use of microscope alone, it is noted, saves a great deal of preparation as cost of preparing specimens of microscopical examination is only one-fourth or one-fifth that of preparing samples for physical test.

WELFARE WORK

Automotive Industry. How Welfare Work Entered the French Automotive Industry—II, W. F. Bradley. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 712-714, 5 figs. Including also a discussion of Italian situation.

Bath Houses. Strong Background for Community Work Is Formed by Bathhouses and Laundries, Donald J. Baker. Coal Age, vol. 16, no. 16, Oct. 16, 1919, pp. 634-637, 3 figs. Results obtained by coal and coke company in Pa. which has established installation of bathhouses and laundries in mining camp.

Coal Mines. Welfare Work at an Anthracite Colliery, Dever C. Ashmead. Coal Age, vol. 17, no. 9, Feb. 26, 1920, pp. 382-385, 6 figs. Welfare endeavors of company include service and advice in connection with maintenance of schools for children of miners.

Coöperative Stores. The Packard Coöperative Store, D. G. Stanbrough. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 281-283. How movement for purchasing of groceries started in 1917 by 35 employes has grown so rapidly under company's auspices that yearly sales increased from $25,000 in 1917 to $175,000 in 1919.

Factories. Welfare Work in Factories, J. Radcliffe. Jl. Roy. Sanitary Inst., vol. 39, no. 3, Feb. 1919, pp. 93-99. Necessity for promoting it.

Welfare Work in Factories and Workshops, Ethel Brown. Jl. Roy. Sanitary Inst., vol. 39, no. 3, Feb. 1919, pp. 99-106. Experience of textile plant in England quoted as example of successful accomplishment.

Factory Doctor. Why a Factory Doctor's Salary Costs Less than Nothing, G. L. Howe. Factory, vol. 24, no. 4, Mar. 1, 1920, pp. 618-621, 2 figs. Writer claims medical supervision is not philanthropy, but a business proposition, and presents figures and facts to bear out his arguments.

Factory Libraries. See LIBRARIES, Factory.

Medical Care. The Ideal Industry from the Standpoint of Health and Safety, C. G. Farnum. Eng. & Indus. Management, vol. 3, no. 24, June 10, 1920, pp. 744-746. Deals with phases of problem of medical work in factories, such as problem of rejections, care of sick, accident prevention, housing problem, etc. Summary of address delivered before Nat. Safety Council.

See also HEALTH, Medical Care of Workers.

Mines. Welfare Work at the Homestake Mine, B. C. Yates. Eng. and Min. Jl., vol. 110, no. 5, July 31, 1920, pp. 198-203, 7 figs. Avoidance of paternalism, a lively interest in clean

amusement, and development of the community spirit, it is said, have been the guiding influences in shaping the human engineering plan followed by the Homestake Mining Co., Lead, S. D.

See also Coal Mines; MINING INDUSTRY, Welfare Work.

Restaurant Plan. A Novel Employees' Restaurant Plan, F. L. Prentiss. Iron Age, vol. 105, no. 9, Feb. 26, 1920, pp. 591-592, 3 figs. Serve-self system of operating restaurant has been discarded and waste is avoided by patrons ordering one day what they will eat the next.

Shop Hospitals. See HOSPITALS, Shop.

Shop Papers. Human Interest in the Employees' Magazine, John T. Bartlett. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 112-115. Editorial attitude to assume in shop papers. Examples of articles published in shop papers which have developed interest among employees.

Steel Industry. Financing Homes for Employees. Iron Trade Rev., vol. 67, no. 2, July 8, 1920, pp. 107-111, 5 figs. Steel Corporation's three alternative plans are: Corporation will build or buy and sell on small payments or on mortgage basis. How rights of both parties are safeguarded is explained.

How Corporation Aids Workers, C. L. Close. Iron Trade Rev., vol. 66, no. 24, June 10, 1920, pp. 1685-1690, 5 figs. Welfare work, accident prevention, stock subscription for employees and pension funds have entailed expenditure of $71,651,731 since 1912. Multiplicity of interests of United States Steel Corp., described by department manager. Paper read before Am. Iron and Steel Inst.

Store Departments. Advantage of a Company Store to a Plant, E. E. Adams. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 288-290. Experience of forge-plant superintendent who conducted company store in connection with supply department, in which, it is said, he saved his workmen 20 per cent. Paper read before Am. Drop Forge Assn.

Technical Institute for Employees. Ford Technical Institute to Better Education of Employees. Motor Age, vol. 38, no. 10, Sept. 2, 1920, p. 26. University plans to confer degrees in mechanical, electrical and chemical engineering.

WELLAND SHIP CANAL

See CANALS, Great Lakes-Atlantic; Welland Ship.

WELLS

Drilling, Cost of. Electric Well Drilling. Natural Gas & Gasoline Jl., vol. 14, no. 2, Feb. 1920, pp. 61-63, 2 figs. Comparative cost of drilling by electricity and steam.

Percolation. The Analysis of Yield Tests Made on a Percolation Well. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 272-273, 2 figs. Analysis of yield tests made on experimental well sunk into water bearing, decomposed and disintegrated granite soil in order to ascertain if locality was suitable for obtaining supply of water sufficient for water supply of small town in South India.

Recovery of Sand Pump. Recovering Lost Sand Pump from a Deep City Well, R. A. Campbell. Eng. World, vol. 16, no. 7, May 1920, pp. 416-418, 6 figs. Special hook was developed after taking impression of existing conditions by means of impression tools.

WHEATSTONE BRIDGE

Hartmann & Braun. A New Wheatstone Bridge for Workshop and Testing Laboratory (Eine neue Wheatstonesche Brücke für Werkstätte und Prüffeld), G. Werner. Elektrotechnischer Anzeiger, vol. 36, nos. 156-157, Dec. 31, 1919, pp. 739-740, 3 figs. Hartmann & Braun instrument, without reversing devices, but with multiple standard resistances.

WHITLEY COUNCILS

See EMPLOYEES' REPRESENTATION, Whitley Councils; INDUSTRIAL RELATIONS, Whitley Councils.

WINCHES

Electric. Efficiency in Electric-Winch Design, Sv. Fasting. Motorship, vol. 5, no. 9, Sept. 1920, pp. 812-815, 3 figs. Diagrams showing relative values of winch with standard type of dynamic breaking and winch equipped with Shepard automatic mechanical load brake.

Electrically-Driven Winches and Capstans. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 689-691, 8 figs. Features of design that have to be provided in order to meet special requirements of these plants, such as their being submerged by heavy seas breaking on board and tropical conditions of heat and moisture.

WIND

See METEOROLOGY, Wind.

WIND PRESSURE

Distribution. On the Relation between Wind and the Distribution of Pressure, Harold Jeffreys. Proc. Roy. Soc., vol. 96, no. A-676, Oct. 9, 1919, pp. 233-249, 8 figs. From study of about 600 wind observations over North Sea.

Miscellaneous Structures. Wind Loads on Miscellaneous Structures, R. Fleming. Eng. News-Rec., vol. 85, no. 2, July 8, 1920, pp. 66-68. Consideration of wind pressure to be assumed on billboards, sky signs, fences and walls, traveling cranes, flags and flag poles. Code provisions and practical recommendations.

WIND TUNNELS

Aerodynamical Torsion Balance. An Aerodynamical Torsion Balance, A. F. Zahm. Jl. Franklin Inst., vol. 189, no. 4, Apr. 1920, pp. 463-468, 6 figs. Describes instrument consisting of a vertical steel spindle rod supported from a torsion head by means of a thin steel ribbon and steadied in at least two places by ball bearings, lower end of shaft terminating a short distance above center of wind tunnel in which models are to be tested.

Air Flow, Visualization of. High Efficiency Air Flow, F. W. Caldwell and E. N. Fales. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 403-414, 15 figs. Means for visualizing air flow employed at wind tunnel at McCook Aviation Field, Dayton, Ohio.

Study of Flight Vortices, F. W. Caldwell and E. N. Fales. Eng., vol. 109, nos. 2833 and 2834, April 16 and 23, 1920, pp. 501-504, 9 figs. and 534-537, 15 figs. Method of visualizing air flow in wind tunnel by fog condensation of moisture in air is explained and photographs of flight vortices thus obtained are presented.

Balances for. Wind Tunnel Balances, Edward P. Warner and F. H. Norton. Nat. Advisory Committee for Aeronautics, no. 72, 1920, 40 pp., 19 figs. Comparative study of various types undertaken with a view to selecting balance for Langley Field wind tunnel. Balance selected was type used in National Physical Laboratory, distinguishing feature of which is carrying of whole balance on single pivot, thus permitting it to rock in two planes. Original design was slightly modified to permit measurements of larger forces.

Design. The Design of Wind Tunnels and Wind Tunnel Propellers, Edward P. Warner, F. H.

Norton and C. M. Hebbert. Nat. Advisory Committee for Aeronautics, report no. 73, 1919, 24 pp., 16 figs. Application of Dryewiecki theory.

Importance of. See AIRSHIPS, Testing Models.

Model Experiments. Wind Tunnel Studies in Aerodynamic Phenomena at High Speed, F. W. Caldwell and E. N. Fales. Nat. Advisory Committee for Aeronautics, Report No. 83, 1920, 52 pp., 42 figs. Description of model wind-tunnel experiments, McCook Field wind tunnel and of method there employed of visualing flight vortices by condensation of moisture in air, together with account of model tests on propeller aerofoils.

Pressure Gage for. Absolute Pressure Gauge for Wind Tunnel Use, J. G. Coffin. Aviation, vol. 8, no. 6, April 15, 1920, pp. 235-237, 5 figs. Apparatus employed at Research Laboratory at Curtiss Aerodynamical Laboratories. Air-speed dimensions are based upon readings produced by standard pitot tube on absolute pressure gage.

Recording Instruments. Recording Instrument for Use in Wind Tunnels, Albert A. Merrill. Aviation, vol. 8, no. 5, Apr. 1, 1920, pp. 190-191, 5 figs. Attachment to aerodynamical balance employed for experimental work at Throop College, Pasadena, Cal., for recording graphically variation of force in tunnel.

Static Pressure Gradients. Static Pressure Gradients in Wind Tunnel Work, J. G. Coffin. Aviation, vol. 8, no. 8, May 15, 1920, pp. 317-318, 4 figs. Formula for computing tunnel axis force, and method of computing pressure-gradient corrections.

[See also LABORATORIES, Aeronautic.]

WINDING ENGINES

See HOISTS, Mine; MINE HOISTS, Electric.

WINDMILLS

Calculation of. Calculation of Windmills (Beitrag zur Berechnung der Windkraftmaschinen), Hans Baudisch. Zeitschrift für das gesamte Turbinenwesen, vol. 17, nos. 11 and 12, Apr. 20 and 30, 1920, pp. 125-128 and 136-139, 7 figs. Shows how use of the specific speed concept makes it possible to compare with one another different types of windmills of different diameters at different speeds and wind velocities.

WINDOWS

See Rain Guards, Centrifugal.

WIRE

Aluminum, Joints for. See ALUMINUM, Wire Joints.

Insulated. See ELECTRIC CONDUCTORS, Rubber-Insulated Wire.

Steel, Strength of. See STEEL, Wire, Tensile-Strength Chart.

Welding. See WELDING, Iron Wire.

WIRE DRAWING

Dies for. See DIES, Wire-Drawing, Diamond.

Electric Heating for. Heat Treatment by Electricity for Wire Drawing. Elec. Rev. (Chicago), vol. 76, no. 23, June 5, 1920, pp. 947-948, 2 figs. Electricity is found to be more economical and more satisfactory than coke for heating steel in manufacture of wire at plant of Holcomb Steel Co., Syracuse, N. Y.

Steel, Theory of. Steel Wire and Wire Drawing, E. A. Atkins. Eng., vol. 109, nos. 2839 and 2840, May 28 and June 4, 1920, pp. 731-734, 19 figs., and 749-752, 15 figs. Theory of wire drawing, with photomicrographs showing deformation of crystals during flow of steel and stress-strain diagrams of various alloy steels. Impurities in steel as they affect wire-drawing. Paper read before Liverpool Eng. Soc.

WIRE ROPE

Care of. Suggestions for Care of Wire Rope, James F. Howe. Eng. World, vol. 17, no. 1, July 1920, pp. 36-37. Directions for attaching sockets to wire rope are included.

Defects in. Failures Caused by Defects in Winding Ropes. Colliery Guardian, vol. 118, nos. 3069 and 3070, Oct. 24 and 31, 1919, pp. 1097-1098 and 1175-1176, 9 figs. Also in Quarry, vol. 25, nos. 275 and 276, Jan. and Feb. 1920, pp. 13-16 and 41-43, 9 figs. Description of material and construction of wire ropes used in winding and study of influences which may be expected to affect their strength. Systems of testing carried out by various manufacturers.

Mine Uses. Safe Practice in Using Wire Ropes in Mines, R. H. Kudlich and O. P. Hood. Dept. Interior, Bur. of Mines, technical paper 237, 1919, 11 pp. Outlines what is termed approved practice and precautions to insure safety.

Stresses in. Winding Ropes and Bending Stresses, C. Speer. Quarry, vol. 25, no. 277, Mar. 1920, pp. 57-59, 6 figs. Experiments are reported which proved that spirally twisted wires in rope are more flexible than when straightened out. Reasons for this phenomenon are advanced. Translated from Glückauf.

[See also CABLES, HOISTING; ELEVATORS, Ropes.]

WIRED GLASS

See FIRE PROTECTION, Wired Glass.

WIRELESS TELEGRAPHY

See RADIO COMMUNICATION; RADIOTELEGRAPHY.

WIRELESS TELEPHONY

See RADIOTELEPHONY.

WIRING

Portable Cord. The Wiring Committee's Investigation of Portable Cords. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 65-66. Durability tests conducted by Electrical Testing Laboratories.

WOMEN WORKERS

Efficiency. The Works and Products of Messrs. Barr and Stroud, Limited. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 363-365, 4 figs. Employment of female labor at these works is said to have shown that "women, with suitable training, could prove as efficient as men in some ordinary instrument-making work."

Government Service. Women in the Government Service. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 208-217. Summary of report prepared by Women's Bureau of U. S. Dept. of Labor.

Post-War Employment, England. Post-War Employment of British Women. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 292-298. Report of Women's Employment Committee of British Ministry of Reconstruction. Importance is emphasized of giving women "as wide an opportunity of employment as other considerations may permit."

WOOD

Aircraft Uses. See AIRCRAFT CONSTRUCTION MATERIALS, Wood.

Allowable Stresses. Douglas Fir as a Structural Timber. Can. Engr., vol. 39, no. 11, Sept. 9, 1920, pp. 317-318. Table of working stresses adopted by various authorities, such as Department of Railways and Canals, Canada, Am. Ry. Eng. & Maintenance-of-Way Assn., etc.

Cellulose in, Determination of. Some Observations on the Determination of Cellulose in Woods, S. A. Mahood. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 873-875. Experiments to investigate effect of size of particle on yield of cellulose. Material which passes an 80-mesh standard (Am. Soc. C. E.) sieve but is retained on 100-mesh sieve was found to be most satisfactory from standpoint of both yield and manipulation.

Distillation. Recent Developments in the Hardwood Distillation Industry and Suggestions for the Future, L. F. Hawley. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 466-468, 2 figs. Work on increase and variation of yields of pyroligneous products: acetate of lime, methanol and charcoal. Cord stocks cut into 5-in. blocks. Control of retorting temperatures. Central research organization.

Drying. Phenomena of Drying Wood, Harry D. Tiemann. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 645-648, 1 fig. Analogistic explanation of "casehardening" or the relations of "set" and stresses that occur in drying wood.

Effects of Moisture on. Tests on the Action of Heat and Humidity on Structures of Hetzer Type (Essais sur l'action de la chaleur et de l'humidité sur les constructions du système Hetzer), A. Freymond. Bulletin technique de la Suisse romande, vol. 46, no. 15, July 24, 1920, pp. 169-170 and 174-175, 1 fig. Hetzer wooden structures employ special system of placing beams which somewhat resembles method used in metallic structures. They have been used for building of railway bridges by the Swiss Federal Railways. Hetzer system is described in Schweiz. Bauzeitung, no. 16, 1911.

Kiln Drying. Inadequacy of Visual Inspection in Kiln-Drying, H. D. Tiemann. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 352-354. Experimental work at Forest Products Laboratory of U. S. Forest Service, Madison, Wis.

The Effects of Kiln-Drying on Commercial White Ash, H. J. Rosenthal. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 774-779, 3 figs. From tests at Forest Products Laboratory at Madison, Wis., in connection with war-time construction program of Air Service.

Moisture Content. Method for Determining the Moisture Content of Wood. Ry. Mech. Engr. vol. 93, no. 12, Dec. 1919, pp. 717-718, 4 figs. Directions issued by Forest Products Laboratory.

Moisture-Resistant Finishes. Moisture Resistant Finishes for Airplane Woods, M. E. Dunlap. Nat. Advisory Committee for Aeronautics, report no. 85, 1920, 8 pp., 2 figs. Investigations made at Forest Products Laboratory. Types tested were oil, wax, oil varnish, enamel, spirit varnish, cellulose varnish, condensation varnish, rubber coating and metal coating. Graph showing relative effectiveness of different materials and methods of treatment.

Preservation. See WOOD PRESERVATION.

Properties. Properties of Woods at 10 Per Cent Moisture, B. C. Boulton. Aerial Age, vol. 12, no. 1, Sept. 13, 1920, pp. 11-13 and p. 30, 1 fig. Table of strength properties of woods reduced to standard moisture of 15 per cent prepared by Forest Products Laboratory for use of aeroplane designers in Navy, is reduced to bases of 10 per cent moisture content.

Seasoning. See Fireproofing.

Tar Distillation. Tar-Still Operation in Hardwood Distillation Plants, L. F. Hawley and H. N. Calderwood, Jr. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 684-685. Tests made to determine effects of speed and steam pressure. Directions for tar-still operation are suggested.

Tests. Compression Tests with Wood (Druckversuche mit Holz), Trauer. Eisenbau, vol. 10, no. 7, July 1919, pp. 139-151, 29 figs. Showing results of tests made with oak and pine wood.

Inspection and Construction of Modern Carriage and Wagon Stock. Ry. Engr., vol. 40, no. 478, Nov. 1919, pp. 146-251, 4 figs. Method of testing.

Weights of Species. Average Weights of Various Species of Wood. Eng. & Contracting, vol. 52, no. 22, Nov. 26, 1919, p. 610. Table giving figures computed by U. S. Forest Products Laboratory.

[See also AIRCRAFT CONSTRUCTION MATERIALS, Timber; Wood; LUMBER; TIMBER.]

WOOD PRESERVATION

A.R.E.A. Specifications. Report of Committee XVII—Wood Preservation. Bul. Am. Ry. Eng. Assn., vol. 21, no. 222, Dec. 1919, pp. 295-337, 18 figs. Specifications are quoted for preservative treatment of wood, (1) with zinc chloride, (2) with creosote oil, full-cell process, (3) with zinc chloride and creosote oil, (4) with creosote oil, empty-cell process with final vacuum, and (5) with creosote oil, empty-cell process with initial air and final vacuum.

Balsa Wood. Balsa, M. E. Pennington. A.S.E.E. Jl., vol. 6, no. 4, Jan. 1920, pp. 256-271 and (discussion) pp. 271-276, 13 figs. Notes on habitat of balsa wood, wood preservation, waterproofing, strength, relative combustibility and insulation.

New Methods. Wood Preservers Hold Convention. Ry. Maintenance Engr., vol. 16, no. 3, Mar. 1920, pp. 103-111, 3 figs. Report of meeting in Chicago, including report of Committee on Service Records, papers and discussions on separation of cross-ties, rapid deterioration of sap pine ties, some new ideas on preservation and report of Committee on Plant Operation.

Surface Perforation. Timber Perforating Patent Given to Public. Ry. Maintenance Engr., vol. 16, no. 1, Jan. 1920, pp. 17-18, 2 figs. Goss patent which consists of method of puncturing surface of wood to be treated by holes systematically located at uniform distances apart, both transversely and longitudinally, distances depending on known normal absorption of preservative with and across grain of wood under given time of immersion, pressure and size of perforations.

Theory of. A Theory on the Mechanism of the Protection of Wood, Ernest Bateman. Ry. Signal Engr., vol. 13, no. 6, June 1920, p. 259. Theory states that any substance to be an efficient wood preservative must be soluble in water at least to extent of producing a toxic water solution; creosote oil may be considered as consisting of two groups of compounds, one toxic and the other not toxic; non-toxic oil acts as reservoir for toxic oils and feeds them automatically, etc. Abstract of papers presented before Am. Wood Preservers' Assn.

Treating Methods. Inaccuracy of Treating Methods Due to Moisture in Wood, Ernest Bateman. Chem. & Metallurgical Eng., vol. 2 no. 2, Jan. 14, 1920, pp. 57-59. Account of experimental work to determine reactions taking place in treatment of wood with inorganic salt preservatives. It was concluded that

"there is no apparent reason to suppose that a chemical combination results from the treatment of wood with most inorganic salts, such as zinc chloride, zinc sulphate, sodium fluoride, calcium chloride, etc." and that "any system of measuring the absorption of salt by wood during treatment which is based on a measurement of the weight or volume of the solution before or after treatment is liable to a very considerable error."

Zinc-Chloride Treatment. Report of Committee on Wood Preservation. Ry. Age (Daily Edition), vol. 68, no. 11c, Mar. 18, 1920, pp. 924-928. Specification for preservative treatment of wood with zinc chloride. Recommended by Committee of Am. Ry. Eng. Assn.

The Leaching of Zinc Chloride from Treated Wood, Ernest Bateman. Bul. Am. Ry. Eng. Assn., vol. 22, no. 227, July 1920, pp. 73-87, 7 figs. Factors which control length of life of preservative.

WOOD PULP

Production. See PAPER MANUFACTURE, Eddy Mills, Hull, Canada.

Research. See PAPER, Research.

WOODWORKING INDUSTRY

Costs. Accumulation of Costs in Woodworking, Carle M. Bigelow. Indus. Management, vol. 59, no. 6, June 1920, pp. 480-482. Interpretation of woodworking factory costs.

Management Methods. Systematic Production in Millwork, W. H. Rohr. Wood-Worker, vol. 39, no. 5, July 1920, pp. 25-27, 8 figs. Writer states that systematic production is just as practicable and necessary in millwork as in any other branch of wood-working industry, and outlines a system being carried out in one plant.

See also INDUSTRIAL MANAGEMENT, Woodworking Industry.

Need of Engineering Skill in. The Engineer and the Woodworking Industry, Thomas D. Perry. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 448-450, 3 figs. Scope of woodworking field is outlined and engineering problems involved are presented. It is said there exists an urgent need of engineering skill in woodworking industry.

Wages and Hours of Work. See WAGES, Woodworking Industry.

WOODWORKING MACHINES

Molder. A Semi-Automatic Molding Machine for Wood (Halbautomatische Holafräsemaschine). Holzwelt, vol. 7, no. 11, Feb. 6, 1920, pp. 5-6, 4 figs. Machine for production of profiled articles of wood or similar material.

[See also LATHES, Wood, Automatic.]

WOODWORKING PLANTS

Accounting for. See ACCOUNTING, Woodworking Shops.

Waste Prevention in. See WASTE PREVENTION.

WORK

Virtual. See MECHANICS, Work.

WORKERS

Medical Care. See HEALTH, Medical Care of Workers.

[See also EMPLOYEES.]

WORKMEN'S COMPENSATION

Accident Frequency and Severity Rates. New Basis for Measuring Accident Frequency and Severity Rates. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 218-219. Committee on Statistics and Compensation Insurance Cost of Int. Assn. of Indus. Accident Board and Commissions recommends that accident rates, both frequency rates and severity rates, be computed on basis of 1000 hours' exposure instead of 3000 hours' exposure.

Accident Liability. Determining Accident Liability, Chesla C. Sherlock. Iron Trade Rev., vol. 65, no. 21, Nov. 20, 1919, pp. 1384-1385. Points out extent of damages based on depreciation of earning capacity of workman in his trade, regardless of what wage his employer may continue to pay him.

Attorney's Fees. Notices and Claims Under Compensation Acts, Chesla C. Sherlock. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 844-846. Concerning costs, particularly attorney's fees, in proceedings under Workmen's Compensation acts.

Digest of State Laws. A Workman's Compensation Digest, Chesla C. Sherlock. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 77-80, 1 fig. Digest of practice in States which have compensation acts.

Kentucky Coal Mine. Coal-Mine Compensation in Kentucky, Herbert M. Wilson. Coal Age, vol. 17, no. 25, June 17, 1920, pp. 1259-1262. Inspection reports, safety-engineering service, low cost and checking up of experience records are said to be features of system designed to exceed possibilities of mutual or self-insurance.

Ladders. See LADDERS, Safety Code.

Laws on, Revision of. The Cost of Industrial Accidents, Royal Meeker. Monthly Labor Rev., vol. 10, no. 4, Apr. 1920, pp. 1-13. Plea is made for revising the compensation laws which have been enacted in the various states. These laws show, it is claimed, lack of uniformity in coverage and inexplicable inequalities in money and medical compensation. It is also urged that accurate and up-to-date statistics of industrial accidents causing physical injuries be kept in all states and territories.

Laws on, Scope of. Scope and Operation of the Workmen's Compensation Laws of the United States, Lindley D. Clark. Monthly Labor Rev., vol. 10, no. 4, Apr. 1920, pp. 14-32, 1 fig. on supp. plate. Comparative study of laws of the various states.

WORKS COUNCILS

See EMPLOYEES' REPRESENTATION Shop Committees; Works Councils; INDUSTRIAL RELATIONS, Works Councils.

WORM GEARS

See GEARS, Worm.

WORM WHEELS

Cutting. See HOBBING MACHINES.

Patterns. See GEARS, Patterns.

WRENCHES

Spring-Handled. Wrench with Inserted Spring (Schraubenschlüssel mit Federeinsatz), H. Steinitz. Motorwagen, vol. 22, no. 34, Dec. 10, 1919, pp. 653-654, 3 figs. Description and illustration of the Dringos wrench having a hinged handle the two parts of which are connected by a tension spring, intended for use when bolts must not be tightened beyond a certain tension and said to effect a great saving in time and assembly work.

WULFENITE

Concentration. Wulfenite: Its Concentration and Separation from Barite, J. P. Bonardi. Jl. Franklin Inst., vol. 189, no. 1, Jan. 1920, pp. 47-61. Results found with experimental Wilfley table are said to have indicated that wulfenite can be concentrated from barite gangue.

X

X-RAYS

Action Upon Plates. The Behavior of Photographic Plates to X-Rays, O. Bloch and F. F. Renwick. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 40-46, 7 figs. Account of work done in Research Laboratories of Ilford, Limited, on action of X-rays upon gelatine dry plates.

Crystals and. See CRYSTALS, X-Rays and; SPECTROMETERS, Bragg.

Diffraction by Crystals. Intensity of X-Ray Diffracted by Crystals (Sur le calcul de l'intensité des rayons X diffractés par les cristaux), Georges Friedel. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 24, Dec. 15, 1919, pp. 1147-1150. Formula developed from Bragg's empirical law, that intensity is inversely proportional to square of sine of angle made by incident ray with reflecting plane.

Intensity, Measurement of. A Method for Measuring the Intensity of Röntgen Rays Together with Certain Temporary Absorption Determinations (Eine Methode für Intensitätsmessungen bei Röntgenstrahlen nebst einigen vorläufigen Absorptionsbestimmungen), Manne Siegbahn and K. A. Wingårdh. Physikalische Zeitschrift, vol. 21, no. 4, Feb. 15, 1920, pp. 83-88, 4 figs. Account of experiments carried out at Physical Inst. of University of Lund, according to so-called zero method, whereby two monochromatic rays coming from same Röntgen tube are equalized in two different ionization chambers at equal intensity. Notes on apparatus used for experiments on absorption of copper and aluminum, etc.

Interference of. The Interference of X-Rays, K. Siebel. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 150-151, 4 figs. Experiments to prove vibratory nature of Röntgen rays. Translated from Kosmos (Stuttgart).

Penetration. The Penetration of X-Rays into Solid Bodies (Ueber das Eindringen von Kanalstrahlen in feste Körper), Heinrich Rausch v. Traubenberg. Jahrbuch der Radioaktivität u. Elektronik, vol. 16, no. 3, Mar. 30, 1920, pp. 283-292. Gives results of investigations by Stark and Wendt and experiments of Flimme and Koenigsberger. Discussion of reflection of X-rays on solid bodies, and emission of electrons by the rebound of X-rays on solid bodies—secondary rays.

Refraction. The Refraction of Röntgen Rays (Zur Frage der Brechung der Röntgenstrahlen), P. Knipping. Zeitschrift für Physik (formerly Berichte der deutschen physikailschen Gesellschaft), vol. 1, no. 1, 1920, pp. 40-41. Writer sees in Stenström's experiments a probable confirmation of Madelung's theory that on the surface of a crystal a loosening of structure takes place perpendicular to surface, and in any case the Stenström deviations can only partially be attributed to refraction.

Scattering. Note on the Scattering of X-Rays, R. A. Houstoun. Proc. Roy. Soc. of Edinburgh, vol. 40, part 1, pp. 43-50, 5 figs. Explanation of Thomson's theory to cover increase of scattering with heavy elements for soft rays, extra radiation and low value of scattering coefficient of γ.

Soft. Note on Article by H. M. Dadourian on "Soft X-Rays." Elizabeth R. Laird. Physical Rev., vol. 15, no. 4, sec. series, Apr. 1920, pp. 293-296, 1 fig. Points out that unless field is fully symmetrical one kind of ions or of rays will get through and light is not thus trapped; use of secondary field renders uncertain value of supposed retarding field. Experiments are described exhibiting similar variations, the incorrectness of which is shown by comparison of photoelectric and ionization currents, and by observations with apparatus further denuded of gas. Discussion of use of term of soft X-Rays.

Soft X-Rays Produced by Cathode Rays of from 200 to 600 Volts Velocities, Elizabeth R. Laird and Vola P. Barton. Physical Rev., vol. 15, no. 4, sec. series, Apr. 1920, pp. 297-308, 6 figs. New experiment is described showing difficulties in measuring a photoelectric effect due to soft X-Rays produced in same chamber as that which contains photoelectric electrode. Details of relative intensities and actual ionization current at 600 volts; intensity at 300 volts was less than 2 per cent of that at 600 volts. Tests show that effects thus far obtained were due to gas in tube and not to radiation from solid anticathode.

Spectrometric Research. Spectrometric Researches on X-Rays (Recherches spectrométriques sur les rayons X), M. A. Dauvillier. Annales de Physique, vol. 13, March-April, 1920, pp. 49-134, 22 figs. Studies cover: Observations with Bragg's spectrometer of X-Ray cathodic spectra; verification of absorption phenomena discovered by Barkla; oscillagraphic study of discharge in Coolidge tube; outline of principles of precise spectrometry; and theoretical and experimental investigation of effect of electronic density at focus.

Use in Metallography. See RADIOMETALLOGRAPHY.

[See also RADIOMETALLOGRAPHY.]

XENON

Spectrum of. See SPECTRA, Krypton and Xenon.

Y

YACHTS

Oil Electric. The Oil-Electric Yacht "Guinivere." Am. Marine Engr., vol. 15, no. 4, April 1920, pp. 9-10. Power plant is to consist of two 6-cyl., 350-hp. model 24-A Winton Diesel oil engines of 225 r.p.m., each direct-connected to a 225-kw., 125-volt Westinghouse d.c. generator.

YARN

Spinning and Dyeing. Progress in the Chemical Technology of Spinning Yarns (Neuerungen in der chemischen Technologie der Spinnfasern), Richard Loewenthal. Chemiker-Zeitung, vol. 43, nos. 126, 127 and 129, Oct. 18, 21 and 25, 1919, pp. 709-711, 719-720 and 729-731. Notes on paper-yarn industry, cotton, wool and artificial silk fibers, washing and bleaching, dyeing, the fastness of dyes, and theory of coloring process.

YEAST

Action of. Yeast Growth and Alcoholic Fermentation by Living Yeast, Arthur Slator. Jl. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 391R-392R. Results obtained in experimenting with malt wort used to explain action of yeast in other cases.

Z

ZEOLITE PROCESS

See BOILER FEEDWATER, Softening.

ZEPPELINS

See AIRSHIPS, Zeppelin.

ZINC

Alloys. See ZINC ALLOYS.

Black Finish for. Coloring Zinc Black (Verfahren, das Zink schwarz zu färben). Metall-Technik, vol. 46, no. 3-4, Jan. 20, 1920, p. 12. Description of two processes by Bottger and one by Dullo, which are said to be simple and expedient and with which a very good color is obtained, resembling black marble.

Electrolytic Production. Methods for Analytical Control of Electrolytic Zinc Production, H. F. Bradley. Chem. & Metallurgical Eng., vol. 22, no. 14, Apr. 7, 1920, pp. 651-654, 1 fig. Methods used at laboratory of Judge Mining & Smelting Co., Park City, Utah, for analysis of leach and electrolyte solutions, concentrates, calcines and leach residues, zinc-dust precipitate and anode scale from cells.

Ore Smelting. See ELECTRIC FURNACES, Zinc-Ore Smelting.

Pressed and Rolled. Contributions to the Technology of Pressed and Rolled Zinc (Einige Beiträge zur Technologie des Press- und Walzzinks). Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 1, Aug. 1919, pp. 23-42, 23 figs. Compilation of technological studies on zinc, including investigations of seam flaws in rolled zinc; effect of working temperature on strength of pressed zinc; notched-bar tests; formation of a coarse crystalline structure caused by heating of pressed zinc; and alloyed pressed zinc.

Production. New Method of Zinc Production, Stanley C. Bullock. Metal Industry (Lond.), vol. 16, no. 7, Feb. 13, 1920, pp. 121-123. Possibilities of electrolytic, and electrothermic processes as substitutes for distillation process. Electrolytic process is considered as capable of competing with distillation, but it is pointed out that to do this, plant must be erected with large capacities as economy of process depends upon its mechanical features and these only show to advantage when quantity of raw product to be handled is such that man-handling is impossible under present conditions of labor.

Zinc. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 120-122. Statistics of production for 1919.

Spelter Industry. The Spelter Industry, T. Turner. Metal Industry, vol. 15, no. 23, Dec. 5, 1919, pp. 470-474. Economical aspects of industry in Great Britain and United States compared.

ZINC ALLOYS

Copper-Aluminum-Zinc. The Utilization of Zinc Fuse Alloys (Verwertung von Zinkzünderlegierung). Metall, vol. 1919, no. 20, Oct. 25, 1919, pp. 274-275. Discussion of article by Prof. Gürtler published in Zeitschrift für Metallkunde (no. 4, 1919) on the utilization of a zinc alloy containing 6 per cent copper and up to 3.5 per cent aluminum.

Zinc Alloys with Aluminum and Copper, Walter Rosenhain, John L. Haughton and Kathleen E. Bingham. Metal Industry (Lond.), vol. 16, no. 14, Apr. 2, 1920, pp. 271-279, 6 figs. Based on tensile and hardness tests and tests to determine heat treatment on mechanical properties conducted at National Physical Laboratory, Teddington, England. In alloys tested copper content was limited to 10 per cent and aluminum to 15 per cent.

Ziskon and Zisium. The Trade Origin of Two Valuable Alloys, R. E. Search. Metal Industry (N. Y.), vol. 18, no. 6, June 1920, p. 269. Account of ziskon, composed of from three to four parts of zinc to one part of aluminum; and zisium, containing zinc, tin and copper with trace of antimony and which is said to be closely allied to magnalium used in manufacturing cane and umbrella handles.

ZINC BRONZE

See BRONZES, Zinc.

ZINC INDUSTRY

Oklahoma, Missouri and Kansas. The Zinc Industry of the Tri-State Field, Francis Judson Tietsort. Compressed Air Mag., vol. 25, no. 5, May 1920, pp. 9635-9643, 15 figs. Survey of conditions with notes on future production and marketing problems. Work of Am. Zinc Inst. in developing zinc industry is noted.

ZINC METALLURGY

Blast Roasting. Blast Roasting at Port Pirie, Gilbert Rigg. Chem. & Metallurgical Eng., vol. 22, no. 11, Mar. 17, 1920, pp. 518-520. Advantages of using granulated slag as constituent of roaster charge sinter physically, economy in use of ironstone, economy in crushing ironstone, higher Pb content of sinter, and higher ZnO content of slag.

Crucibles. Dimensions of Crucibles for Use in Zinc Works (Le calcul des dimensions des creusets des usines a zinc), L. Neuray. Revue Universelle des Mines, vol. 6, no. 1, July 1, 1920, pp. 55-64. Formulæ for computing dimensions.

Dry-Process Losses. See LEAD METALLURGY, Dry Process Losses.

Electric Smelting. See ELECTRIC FURNACES, Zinc-Ore Smelting.

Electrolytic Plants. Electrolytic Zinc Plant of the Judge Mining & Smelting Co., L. W. Chapman. Chem. & Met. Eng., vol. 22, no. 12, Mar. 24, 1920, pp. 537-540, 5 figs. Plant is designed to treat concentrates obtained from sulphide ore containing zinc, lead and silver.

The Electrolytic Zinc Plant of the Consolidated Mining & Smelting Co. of Canada, Ltd., L. W. Chapman. Chem. & Metallurgical Eng., vol. 23, no. 6, Aug. 11, 1920, pp. 227-231, 6 figs. At Trail, B. C., solution for electrodeposition of zinc is prepared by treating calcined concentrates with neutral leach, followed by acid leach. Construction details of tank room, cells, busbars, anodes and cathodes.

Muffles. Pressure in Zinc Muffles (Ueber die in den Zinkmuffein herrschende Spannung), O. Mühlhaeuser. Metall u. Erz, vol. 16, no. 22, Nov. 1919, pp. 538-544, 7 figs. Results of experiments are said to show that pressures existing in combustion chambers within a period of distillation do not vary considerably, whereas pressures in muffles constantly increase or decrease, or greatly fluctuate; pressures within muffles are for most part greater than in zinc ovens, sometimes less or approximately the same, and same is true of tensions in condensers which are just as great or less than pressures in the muffles.

ZINC MINING

Wisconsin District. Development Practice in the Wisconsin Zinc District, Edwin R. Shorey.

Min. & Metallurgy, no. 164, Aug. 1920, pp. 22-23. Attention is directed specially to methods of sinking shafts. Sinking speeds average 15 to 20 ft. per week. (Abstract.)

ZINC ORE

German Industry. See LEAD ORE, German Industry.

ZIRCONIUM

Brazilian Ore, Analysis of. The Analysis of Brazilian Zirconium Ore, A. R. Powell and W. R. Schoeller. Analyst, vol. 44, no. 525, Dec. 1919, pp. 397-400. Opening up ore by fusion with sodium carbonate followed by bisulphate treatment is reported as having proven more satisfactory than ordinary scheme.

Determination. The Determination of Zirconium by the Phosphate Method, G. E. F. Lundell and H. B. Knowles. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1801-1808. It is concluded that zirconium can be quantitatively precipitated as secondary zirconium phosphate in cold or tepid solutions containing from two to twenty per cent by weight of sulfuric acid, provided a 10-100-fold excess of precipitant, diamonium phosphate, is used.

Investigations on. Investigations on Zirconium, J. W. Marden and M. N. Rich. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 651-656. Researches at Bureau of Mines concerning preparation of zirconium oxide, crystalline zirconium aluminum alloys, and zirconium metal. Comparative study of methods of analyzing zirconium ores is included.

Production in 1919. See MINERALS, Rare-Earth.

Separation as Phosphate. See TITANIUM, Separation as Phosphate.

[See also TITANIUM.]

Zirconium and Titanium in. The Determination of Zirconium and Titanium in Zirconium Ores, G. E. F. Lundell and H. B. Knowles. Jl. Am. Chem. Soc., vol. 42, no. 7, July 1920, pp. 1439-1448. Methods of decomposition of zirconium ores are listed, and a cupferron method for determination of zirconium and titanium in zirconium ores is given.

ZIRCONYL COMPOUNDS

Preparation. Zirconyl Compounds with the Oxy-Halogen Acids, F. P. Venable and I. W. Smithey. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1722-1727. Preparation of basic zirconyl iodates and stages of progressive hydrolysis.

ZONE FARES

See STREET RAILWAYS, Zone Fares.

ZONING SYSTEM

See CITY PLANNING, Zoning System, Chicago.

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